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### SECTION OF RADIOLOGY AND PHYSIOTHERAPY

WEDNESDAY MORNING, JUNE 8, 1927

**T**HE Section of Radiology and Physiotherapy of the Massachusetts Medical Society convened in the Georgian Room of the Hotel Statler, Boston, Massachusetts, at nine o'clock, Dr. Frank B. Granger, of Boston, presiding.

Announcements about the X-ray Society, by Dr. Cook.

**CHAIRMAN GRANGER:** This Section is priding itself on two things. In the first place, we are trying to have papers which are of general interest to the profession at large, not something that is purely scientific from a roentgenological standpoint or purely scientific from a physiotherapeutic standpoint. We want something that will be valuable to the general profession.

The second point is that this is the second year that the presiding officer will be brief; therefore, without further ado, I will ask Dr. Kirklin to read this most important paper which gives us an idea of the uses and limitations of the present status of gallbladder pathology from an x-ray point of view.

Dr. B. R. Kirklin, of the Mayo Clinic, Rochester, Minn., then presented his paper.

#### EFFICIENCY AND LIMITATIONS OF CHOLECYSTOGRAPHY\*

BY B. R. KIRKLIN, M.D.

**W**ITHIN the short space of three years cholecystography has attained high eminence among diagnostic procedures, and its wide employment is sufficient proof of its general excellence. Yet, aside from the inevitable disappointment of those diagnosticians who expected the method to be infallible, there are also differences of opinion as to its specific merits and reliability. All these differences are merely a wholesome indication of an effort to make further progress. Some of them, no doubt, arise from differences in technique, in the employment of different drugs and administering them in different ways. However, I believe that the elements mentioned are

of minor responsibility, and that the variances are due principally to a larger and more important factor, namely, the lack of exact knowledge as to where the line shall be drawn between normal and abnormal gallbladders, both anatomically and functionally. If this is true, much work remains to be done by the pathologist and physiologist before the diagnosis of cholecystic disease by any method can be placed on absolutely firm foundations. Cholecystography is primarily a test of function and not essentially a means of demonstrating pathologic changes directly. Moreover, it is a test of functional behavior at the moment of examination, not of past disease which has left no trace, and it cannot prognosticate future events. It is known that a gallbladder containing stones may have walls which are virtually normal, and may yield a cholecystogram normal except for shadows of stone, that of two gallbladders which have only microscopic traces of disease, one may react normally to the test, the other abnormally, and that a grossly diseased gallbladder may react normally and occasionally a normal gallbladder may react abnormally. Attention is directed to these facts not to discredit cholecystography but to defend it; they are exceptions which tend only to confirm the rule.

At the Mayo Clinic, both sodium tetrabromophenolphthalein and sodium tetraiodophenolphthalein have been used extensively in cholecystography, chiefly by the oral method. Sodium phenoltetraiodophthalein has also been used orally in a small series of cases. Although it gave satisfactory results the cholecystograms did not seem to possess any advantage over those resulting from tetraiodophenolphthalein used orally. The intravenous method of administration is also being given trial as a check on doubtful findings with the oral method. The occasional reactions, such as nausea, vomiting and purging, from the oral method of administering either of the salts commonly employed are not only annoying to the patient, but in many instances cast doubt on the validity of the data, thereby necessitating re-examination. Many modifications in the methods of administering the salts commonly employed have been devised only to raise new dif-

\*Read before the Massachusetts Medical Society, Boston, Mass., June 8, 1927.

ficulties. Therefore, we set about at the Mayo Clinic to prepare a new compound which would be free from disagreeable effects and which could be given in liquid form. The result was that in December, 1926, Kendall and I reported the preparation and use of di-iodo-di-ethyl-ether of di-salicyl-phthalein. This drug has proved quite efficient but owing to further work relative to certain modifications and refinements in its preparation we have not had a sufficient supply to use it as a routine or to place it on the market. At the present time, I am using the iodine salt orally for routine examinations. The dose varies from 2.5 to 5 gm., depending on the weight of the patient. He receives the measured dose in plain gelatin capsules, each containing 0.5 gm. of the salt, and is instructed to take it immediately after the evening meal, which must be free from fats. Roentgenograms are made after fourteen, sixteen and twenty hours. The patient may take water, but he must abstain from food until after the sixteenth hour, when he is told to eat a meal rich in fats. The object of this fatty meal is, of course, to stimulate the emptying of the gallbladder.

#### ACCURACY OF CHOLECYSTOGRAPHY

In determining the accuracy of cholecystography as a diagnostic procedure one must consider many factors. First, just what constitutes a diseased gallbladder? The pathologist says that the gallbladder must show definite gross or microscopic evidence of disease, regardless of pericholecystic conditions, in order to confirm a diagnosis of cholecyctic disease. He also says that a high percentage of gallbladders shows microscopic evidence of slight disease. This is comforting if one is only compiling data on positive cholecystographic cases in which the gallbladder has been removed. If, on the other hand, one is carefully checking both the positive and negative cholecystograms one will be disappointed in a rather high percentage of cases showing only slight changes at operation, since many such cases give a normal cholecystographic response.

The diagnostic accuracy of cholecystography can be estimated in various ways, and the percentages derived will be as diverse as the methods of computation. First, cholecystography should show a higher percentage of accuracy in cases with a typical history and clinical signs of gallbladder disease than in clinically doubtful and difficult cases. It is helpful, as well as important, to know the percentage accuracy of cholecystography in any one group of cholecystographic or other diagnoses, but in order properly to evaluate the method a careful comparison should be made of all surgical, pathologic and roentgenologic data, including all positive and negative errors. It is necessary, therefore, before studying a statistical report to know,

first, what type of case (Table 1) has been examined, and, second, to know what particular group or groups of cholecystographic diagnoses (Tables 2 and 3) have been studied, and, third, on what basis a diagnosis of cholecyctic disease has been made at operation.

In reviewing the work in this series, I have accepted the pathologists' reports as final, regardless of the presence or absence of associated evidence of disease; and, if the gallbladder was not removed, the surgeon's diagnosis and opinion was accepted.

In using this method of determining the accuracy of cholecystography, I am not subscribing to it as the best one for I believe that it can still be improved. It will require a careful "follow-up" study of the patients with only slight gallbladder changes to settle definitely just what factors warrant removal of the gallbladder.

During the last eight months of 1926, 3844 patients were examined by cholecystography in the Mayo Clinic. There were approximately 1100 reexaminations, making a total of approximately 5000 cholecystographic examinations during this period. Five hundred and six of the patients were operated on for disease of the gallbladder or other abdominal disease. During the same period there were 224 patients whose gallbladders were explored and removed who had not previously been examined by cholecystography, as the clinical history and examination, including the elimination of the stomach and duodenum as a site of disease by roentgen ray examination, had been definite enough to warrant a diagnosis of cholecyctic disease without cholecystography. At the Clinic the patients who present a definite history and clinical indications of gallbladder disease are not all referred for cholecystographic examination, and this fact must be kept in mind in evaluating my statistics. In this connection it is interesting to note that in the group of cases of "frank" disease of the gallbladder the clinicians' diagnosis of cholecyctic disease was confirmed at operation in approximately 91 per cent. For this reason cholecystography was not employed in this group. However, the clinical diagnosis was not so accurate in the group presenting vague and indefinite clinical data, and it is in this group that cholecystography is valuable.

#### STATISTICAL STUDY

The surgical and pathologic conditions in the 506 cases were as follows: disease of the gallbladder with stones in 250; severe disease of the gallbladder without stones in 124; only slight pathologic changes in the gallbladder without stones in twenty-one, and other abdominal lesions in 111 (Table 1). The gallbladders in the latter cases were pronounced normal by the surgeon and not removed. It is interesting and



important to note that in the group of 250 cases in which gallstones were found cholecystography indicated cholecystic disease in 98.4 per cent. (Table 2). In only 30 per cent. of these cases were gallstone shadows seen and so interpreted. In 66 per cent. of this total group the gallblad-

In this group the intravenous administration of the drug might be of help in correcting the 24.4 per cent. error, for there was a positive cholecystographic response in twenty-seven cases. The gallbladder was invisible in eleven of the latter (40.7 per cent.), while in sixteen (59.2 per cent.)

Table 1  
Patients examined and operated on, 506

Notes at operation	Cases	Röntgen-ray diagnosis of cholecystic disease	Röntgenogram negative	Correct diagnosis, per cent	Error per cent
Diseased gallbladder with stones	250	246	4	98.4	1.6
Severe disease of gallbladder without stones	124	98	26	79.0	21.0
Slight changes in gallbladder	21	14	7	66.6	33.4
Normal gallbladder at exploration	111	27	84	75.6	24.4

In 374 cases of severe disease of the gallbladder, with and without stones, the cholecystogram was positive in 344 (91.9 per cent.).

In 395 cases of cholecystic disease, with and without stones, including cholecystitis, the cholecystogram was positive in 358 (90.6 per cent.).

In the 506 cases, some with and some without disease of the gallbladder, the cholecystogram was correct in 442 (87.3 per cent.).

der did not cast a shadow in the cholecystogram, and in 32.4 per cent. the shadow was persistently faint. Four were cholecystographically negative, an error of 1.6 per cent. Very small gallstones were found in each of the latter.

Cholecystography was correct in 79 per cent. of the 124 cases in which the gallbladder showed marked disease without stones, 21 per cent. giving a normal cholecystographic response. Among the ninety-eight reported positive and proved so at operation the gallbladder was invisible in the cholecystogram in 59+ per cent. while in

it was only faintly visible. Here, in contrast to the former groups, the faint shadows outnumbered the invisible gallbladders. In such groups especially, a careful study should be made by checking with both the oral and intravenous methods. It might be argued that, had the surgeon removed the gallbladders in the twenty-seven cases giving abnormal cholecystographic response and submitted them to the pathologist, pathologic changes which the surgeon was unable to detect might have been revealed. I have no doubt that any competent pathologist might

Table 2

Detailed roentgenologic data

Notes at operation	Cases	Gallbladder invisible	Gallbladder invisible; stone shadows	Faint shadow of gallbladder	Faint shadow of gallstones	Negative (normal response)
Diseased gallbladder with stones	250	112	53	59	22	4
Severe disease without stones	124	57	1	40		26
Slight changes in gallbladder	21	9	1	4		7
Gallbladder normal at exploration	111	11		15	1	84

the remaining 40+ per cent. the gallbladder was only faintly visible.

In the group showing only slight pathologic changes cholecystography was correct in 66.6 per cent.; seven of the gallbladders gave a normal response, ten were invisible, and four produced faint shadows. In this group, as in the preceding ones, most of the gallbladders were invisible.

The group of 111 cases in which the gallbladder was considered to be normal at operation is probably the most interesting group in Table 2.

have found evidence of varying degrees of disease in a fairly large percentage of these cases, but since the patients had other diseases without a definite history or data of gallbladder disease except that revealed by cholecystography, the surgeon thought best to leave the gallbladder alone and to take care of the condition that grossly needed attention.

An analysis of Tables 1 and 2 shows that in the 374 cases of severe disease of the gallbladder with and without stones, cholecystography was correct in 91.9 per cent., and in

the total group of cases in which disease of the gallbladder was found, including the cases in which only slight changes had occurred, it was correct in 90.8 per cent. In the entire group of 506 surgical cases the cholecystographic data agreed with the surgical and pathologic data in 87.3 per cent.

#### EVALUATION OF CHOLECYSTOGRAPHIC SIGNS

It is important to know the value of the different cholecystographic signs (Table 3). In

If it is true that better shadows of the gallbladder can be obtained with the intravenous method of administering dyes than with the oral method, I am fearful that the percentage of error represented in those cases of diseased gallbladders with normal cholecystograms might have been still higher with the intravenous method.

Graham recently reviewed the results of all reported work on cholecystography and for the sake of comparison I shall review them again

Table 3

Analysis of individual roentgenologic signs

Roentgenologic signs	Cases	Diseased gallbladder with stones	Diseased gallbladder	Slight changes in gallbladder	Normal gallbladder	Correct diagnosis, per cent	Error, per cent
Gallbladder invisible	244	185	50	10	11	95.4	4.6
Faint shadow of gallbladder	141	81	40	4	16	88.8	11.2
Total roentgenologic diagnosis of cholecystic disease	385	246	58	14	27	92.9	7.1
Gall stones reported	78	75	1	1	1	96.1	3.9
Negative (normal response)	121	4	26	7	84	69.4	30.6

the group of 506 surgical cases the response with cholecystography was positive or abnormal in 385 and negative in 121. In 244 (63.4 per cent.) of the 385 positive cholecystograms the gallbladder was invisible while in 141 (36.6 per cent.) faint shadows were visible. Gallstone shadows were ignored in compiling these figures, only gallbladder shadows and their character were taken into consideration.

Invisibility is obviously the most important of all signs in cholecystography. Gallbladder disease with and without stones was found in 95.4 per cent. of the 244 cases in which the gallbladder was invisible, and stones were found at operation in 67.6 per cent.

In 141 cases the gallbladder shadow was persistently faint throughout the series. In 88.8 per cent. of these, disease of the gallbladder, with or without stones, was found at operation. Gallstones were demonstrated at operation in eighty-one (57.4 per cent.). Therefore, although the faint shadow sign is not as reliable as invisibility, it is nevertheless significant.

Of the 121 cases in which cholecystograms were normal, one or more small gallstones were found in four at operation, twenty-six gallbladders showed severe cholecystic disease without stones, and seven showed slight pathologic changes and no stones, making a total of thirty-seven cases in which the cholecystogram was negative but cholecystic disease was found at operation. This represents an error of 30.6 per cent. and indicates that in this group of surgical cases the normal cholecystographic response is the least reliable.

here. The cases (561) comprise all those reported in the literature, including his own, in which cholecystographic examination was made and operation performed. Of these, 446 cases were reported as cholecystic disease and the diagnosis was confirmed at operation in 97.8 per cent. In only 74 per cent., however, of the 115 cases in which the cholecystograms were normal were the diagnosis confirmed at operation. Graham's negative cholecystograms are not discussed. His published reports have included only that group in which the gallbladder was removed and positive diagnosis was made by cholecystography. In the entire group of 561 cases the cholecystographic data agreed with the surgical and pathologic data in 90 per cent.

#### SOURCES OF ERROR

As stated at the outset, one of the inevitable sources of error is the so-called cholecystitis I group comprising those cases in which the gallbladder shows only slight microscopic changes. If these gallbladders are accepted as normal there is still a high percentage of error in this group, for many of them give abnormal cholecystographic responses, and experience has shown that many of the patients obtain relief following cholecystectomy. Judd, in reviewing a large number of cases of cholecystitis I without stones, found that marked improvement or cure had occurred in 70 per cent. after cholecystectomy while in 30 per cent. little or no improvement was reported. In approximately 92 per cent. of the cases in which there was typical biliary colic previous to operation definite improvement

or complete relief was reported. It seems reasonable to assume that the slight microscopic changes found in this group may be the remnant of a previous cholecystitis which is at present inactive. I have seen cases in which the gallbladder had been drained and stones removed two or three years previously, which later gave a normal response to cholecystography, and after the gallbladder was removed the pathologist reported cholecystitis 1 and the presence of the scar of the former cholecystostomy. There surely is a point at which microscopic changes must become negligible in condemning a gallbladder as actually diseased.

Error is inevitable in the rare cases of rudimentary gallbladder or congenital absence of the gallbladder. There are three such errors in this group.

H. S. Plummer recently called my attention to a factor which may be of considerable importance in the interpretation of cholecystograms. He has observed that a certain type of patient, characterized by easy fatigability, achlorhydria, and low basal metabolic rate, is likely to respond eccentrically to cholecystography. Almost constantly in patients of this type whom he has studied, the shadow of the gallbladder in the cholecystogram is faint or absent although there is little, if any, history or clinical evidence of cholecystic disease. However, he believes that patients giving such a response may be potential subjects of cholecystic disease. Naturally, exploration of the gallbladder in these cases is seldom warranted, and the cause of the abnormal response to the test remains to be determined. It would seem, however, that interpretation should be guarded in such cases.

In addition to the foregoing sources of error, which may properly be classified as limitations of the method itself, there are many pitfalls which should be regarded as personal errors of interpretation and not charged against cholecystography. Some of these may be enumerated briefly as follows: (1) failure to distinguish a faint shadow from one of normal density, which is a facile source of error, owing to the wide latitude of density of the normal shadow; (2) failure to distinguish mottling of the shadow due to gallstones from that produced by gas in overlying segments of bowel; (3) mistaking a shadow produced by a diseased gallbladder itself for a normal cholecystogram; such a shadow remains constant in size and density throughout the series of cholecystograms; (4) interpreting a large gallbladder shadow as representing disease; the normal gallbladder may become quite distended while the patient is fasting, and unless it remains the same size throughout, size may be ignored, and (5) over-anxiety to interpret a cholecystogram as positive if the gallbladder shadow shows irregularities

of contour. Slight deformities of contour have been of little if any significance in my experience. Occasionally a constant hour-glass deformity or acute angulation will be confirmed at operation but I have seen many perfectly normal contours in the cholecystogram only to find the gallbladder almost buried in adhesions and, on the other hand, an irregular contour in an otherwise normal cholecystogram when the gallbladder was seen to be perfectly free from adhesions or deformities at operation.

Unnecessary errors may easily occur due to faulty technic. It is obvious, of course, that if the patient fails to take the drug, vomits it immediately, or takes food containing fats before the fourteenth or sixteenth hour, the cholecystograms will mislead the examiner. It is important to know whether cholecystectomy has been performed previously. Careful inquiry should be made before one makes, or attempts to interpret, roentgenograms. One should also bear in mind that movement affects the quality of a shadow. The films must cover every possible situation of the gallbladder. Its situation varies with the height and build of the patient; in patients of broad build the gallbladder is usually high, perhaps at the tenth rib, and situated laterally, while in those of slender build the gallbladder is likely to be low, at the third lumbar or even below the crest of the ilium, and situated mesially. If the gallbladder is invisible in a cholecystogram showing large amounts of the dye in the bowel the diagnosis should be checked by reexamination. If the patient is instructed to take the dye during or immediately after the evening meal and to drink water freely, I believe less trouble will be encountered from nonabsorption. My experience has convinced me that less of the dye is seen in the bowel when the drug is given in this way. I recently instructed a group of patients to take the tetraiodophenolphthalein in plain gelatin capsules three or four hours after the evening meal and was surprised and chagrined to see most of the drug in the bowel in masses corresponding to the size and shape of the capsules. Digestion being at its height about three hours after the ingestion of the meal, the acids evidently attack the outer layer of the dye, forming a hardened coating around the periphery of the mass which causes it to continue its journey through the intestines pent up within this wall. Hence absorption is not possible. I have failed to observe this phenomenon when the drug is taken during or immediately following the meal, although occasionally small fragments or lumps of the dye are seen. If these sources of error have been eliminated, an invisible or faintly visible gallbladder should be reported as diseased.

If there is any question concerning technic or interpretation in a given case, another exami-

ation should be made. This is one of the most reliable checks against error and eliminates many embarrassing situations.

To realize thoroughly the possibilities of these sources of error and thus learn to avoid them, there is no better way than to follow the cases to the surgical amphitheater and later to the pathologic laboratory, and compare the roentgenologic and pathologic findings.

#### SUMMARY

Graham's contribution to medicine has given us the most valuable and dependable single laboratory method of diagnosing gallbladder disease. He deserves unstinted praise for his splendid work.

Cholecystography, when the dye has been given orally, should be correct in a high percentage of cases, if careful technic is used and the results are properly interpreted. The method is very accurate in cholecystic disease accompanied by stones. The invisible sign with standard technic is a reliable indication of gallbladder disease while the faint-shadow sign ranks not far behind. On the other hand, I believe that either the oral or the intravenous method is likely to err in cases showing only slight pathologic changes in the gallbladder. In reviewing the published results of other workers as well as my own, I am convinced that a negative or normal cholecystographic response is the least reliable of all signs, since the percentage of error varies from 26 to 30 per cent. It must be remembered that cholecystography is preëminently a test of gallbladder function rather than a method to depict actual disease of the gallbladder. The identification of stones as shown by negative shadows is the single exception.

I believe that for the present, at least, cholecystography should not be relied on without other data to affirm or deny the presence of gallbladder disease. Quite on the contrary, I strongly believe that positive cholecystographic data should be supported by a history and observations suggesting cholecystic disease before a patient is subjected to operation, as a patient with a normal cholecystogram may have a history characteristic of gallbladder disease which is confirmed at operation. That cholecystography is a help is an established fact, especially in doubtful cases, but the family physician or clinician must gather all the evidence together, including that obtained by cholecystography, and carefully weigh it before making the final decision.

I feel sure that with experience and the diffusion of knowledge, cholecystographic diagnosis will attain an accuracy even greater than it now has and will become indispensable.

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CHAIRMAN GRANGER: Before we call upon the discussers, there are one or two announcements to be made.

A Nominating Committee for officers of this Section for the ensuing year has to be appointed and I will appoint Dr. Butler, Dr. O'Toole, and Dr. Brown as members of that Committee. They will meet, present nominations, and report probably just before the last paper.

Dr. Sosman, will you start the discussion of this very conservative, careful and scientific paper?

#### DISCUSSION

DR. MERRILL C. SOSMAN (Boston): Instead of going over the numerical results we have had, I will simply say that it sounds almost like a duplication of the paper Dr. Kirklin has read. As to the criteria of diagnosis, the most reliable one has been the presence of stones. Negative shadows have been confirmed in every case except one. In that case there was reported one small stone and the gall-bladder was not removed at operation so we are not sure. We call that a mistake on our part.

The next most reliable sign is the absence of any gall-bladder shadow. That has been accurate in 94 per cent. of our cases. The faint shadow is less reliable and a deformity is hardly reliable at all in most cases.

Contrary to the findings of Dr. Kirklin, a good dense gall-bladder shadow has nearly always been found to indicate a normal gall-bladder, as we reported. Only two cases which were operated on having been called normal by X-ray were returned with a report of "pathological gall-bladder."

Our pathologist is more conservative than yours. We find more normal gall-bladders than McCarthy reports. Your criteria should be stated. It is not fair for the roentgenologist to base his diagnosis on physiology, the surgeon to base his on inspection and palpation, and the pathologist to base his on the microscopic appearance of the gall-bladder. You have three entirely different things and the only suggestion I have to make in addition to Dr. Kirklin's excellent paper is that we disregard all three in the final check-up and that in the final analysis as to the value of test or clinical history the final result for the patient's benefit alone should be considered.

If we have diagnosed cholecystitis or a pathological gall-bladder and it is removed, what effect does that have on the patient's symptoms? Is the patient entirely relieved of his or her symptoms? That is the attempt we are making at the present time. We hope to follow up every one of our 230 operated cases in the last thousand and see which of the various criteria is most important in deciding whether or not the gall-bladder should be removed and in which group we obtain the highest percentage of clinical relief.



DR. DANIEL F. JONES (Boston): It is a great pleasure to hear such a rational presentation of the subject of cholecystography as Doctor Kirklin has given us.

Before we can determine the real value of this method we must first agree upon a definition of chronic cholecystitis. It is quite easy for some roentgenologists to make a correct diagnosis in 94% of the cases, while another of equal ability will have a much lower percentage of correct results. This is due to the fact that some surgeons are willing to make a diagnosis on the pathologist's report of a few round cells in the wall of the gallbladder, while others must have some convincing clinical evidence of disease. What we are striving for is to relieve patients of their symptoms and not simply to remove gallbladders which have slight microscopical evidences of chronic inflammation. That not all gallbladders which are removed are the cause of the symptoms of which the patient complains is shown by the fact that most surgeons will admit that a substantial percentage of cases are not relieved of their symptoms by removal of the gall bladder. Doctor Judd has told me that very few of the patients who do not have definite attacks of pain are relieved of their symptoms. Let us remember that there are many conditions which can cause right upper quadrant pain other than gall stones.

Cholecystography is of the greatest value as an aid to diagnosis but a diagnosis should never be made on any single piece of evidence. Let us use this new and valuable method in connection with every other bit of evidence that we can get to aid in making the diagnosis.

DR. KIRKLIN: I am glad Dr. Sosman emphasized the importance of carefully checking the results following cholecystectomy for I feel that it is only by a careful and painstaking study of these cases, especially the group showing only slight histologic change and the cholecystographically normal group, that we will be able properly to evaluate our diagnostic methods and also to settle just what data will be sufficient to warrant the removal of the gallbladder. Judd and others have made such observations but it still would seem that there is a point beyond which slight histologic changes in the gallbladder become negligible. Other data, including clinical findings, history and so forth must be considered before a gallbladder is condemned as the offending organ.

I hope that my paper and figures will not leave the impression that I am pessimistic regarding the value of cholecystography, for as a matter of fact I am very optimistic and enthusiastic. I feel that as we learn more of the proper interpretation and evaluation of cholecystography and other gallbladder data it will be an indispensable procedure. However, for the present it is merely one of the important

diagnostic adjuncts and supine dependence on it as a diagnostic procedure to the exclusion of older well-known methods will surely result in more harm than good to the method.

I am grateful to the men who discussed this paper, and I wish to thank the officers of this section and of the Massachusetts Medical Society for the privilege and honor extended to me by their invitation to take part in this program.

CHAIRMAN GRANGER: We will go on with the next paper, which is by Dr. W. Walter Wasson of Denver, Colorado.

## THE HILUS OF THE LUNG<sup>1</sup>

BY W. WALTER WASSON, M.D.

**T**he hilus of the lung, as anatomically considered, is a wedge-shaped fossa on the mediastinal surface of either lung. The root of the lung or radix pulmonis is composed of those structures which pass through this depression. But by common usage the term "hilus" has come to include not only the true hilus but also the radix pulmonis and some of the lung closely adjacent to the radix pulmonis. Thus "hilus tuberculosis" is not tuberculosis of the hilus anatomically considered but rather of the radix pulmonis. On the other hand, "hilus pneumonia" is especially a pneumonia of the lung closely adjacent to the radix pulmonis. In this paper the term "hilus of the lung" will be applied according to common usage.

The hilus of the lung is a common meeting point of all pathways to and from the lung and is closely guarded by lymphatic nodes, strategically situated. There are only a few lymphatics of the pleura which do not drain from the lung into the lymphatic nodes of the radix pulmonis. It would therefore seem that we cannot have any real knowledge of the lung as a whole without a rather intimate knowledge of its hilus. In this paper there will be no attempt to actually storm the citadels of the hilus for information but rather a conscientious attempt will be made to collect certain data and then to correlate these data for a working basis in the diagnosis of diseases of the hilus of the lung. This plan embodies, first, the knowledge of the gross anatomy of the hilus and second, of the histology. The pathology will be studied by the aid of various necropsies. An attempt will be made to show how the difficulties in radiographic portrayal may be overcome. With the radiograph as an aid the cycle of the hilus from birth through to adult life may then be studied. Finally, many special cases illustrating various types of diseases and degrees of pathology will be utilized to supplement the study of the life cycle of the hilus. With all this information as a basis, an attempt will be made to solve some of the perplexing problems of the hilus of the lung, and to enable one to differentiate one disease from another. The grosser le-

sions such as pneumonia, sarcoma, carcinoma will be only casually considered.

#### GROSS ANATOMY

In the description of the gross anatomy all anatomists describe the hilus of the lung as a wedge or club-shaped fossa situated on the mediastinal surface of the lung, slightly nearer the posterior margin than the anterior, and slightly above the middle. The root of the lung, or radix pulmonis, consists of those structures which pass through this fossa. The root is therefore formed by the bronchus, the pulmonary artery, the pulmonary veins, the bronchial artery and veins, the pulmonary plexuses of nerves, lymphatic vessels, bronchial lymph glands, and areolar tissue. These structures as they enter or leave the lung are covered and bound together by a reflection of the pleura and thereby become attached to the other mediastinal structures. There is also a narrow reflection of this pleura downward from the root along the mediastinal surface of the lung and attached to the diaphragm and pericardium, known as the ligamentum latum pulmonis. Campbell<sup>2</sup> has stated that the lungs are suspended by the root and hang free in the pleural cavity. I have previously described this<sup>3</sup> and have noted how the lung rocks about the hilus as a central point and also have noted the movements transmitted to the hilus from the heart and great vessels. This is quite fundamental in the portrayal of these structures by the radiograph. The connective tissue which binds the root of the lung together and extends out into either lung along the bronchi and great vessels plays a very important role, both physiologically and pathologically, and is discussed a great deal by radiologists. The structure will be considered more fully under Histology.

The lobes of the lung are in close apposition to the radix pulmonis with air cells of the lobe partially surrounding the outer portion of the root structures but separated by pleura. It is interesting to note how the bronchi and great vessels going from the root to upper lobes immediately divide into numerous branches, not only giving a different appearance, anatomically and radiographically, to the upper lobes but also broadening the attachment of the lobe to the root. On the other hand<sup>4</sup>, the lower lobes have a very narrow attachment to the root, surrounded by ringlike connective tissue, owing to the fact that the bronchus and great vessels do not divide so rapidly and completely on entering the lower lobes.

#### HISTOLOGY

Let us now consider the more minute anatomy of the hilus<sup>5</sup>. Each main bronchus after leaving the trachea passes through the fossa of the hilus to become part of the radix pulmonis. It is a heavy-walled tube constructed to withstand

strains and infections. It divides into an upper and lower bronchus and on the right the lower divides, sending a third branch to the middle lobe.

The pulmonary artery enters with the bronchus and lies inferior and posterior to the bronchus. It is also a fairly heavy-walled tube but not so much so as the bronchus. Its branches correspond very closely to the branching of the bronchi. As the artery leaves the radix pulmonis to enter the various lobes it lies superior and lateral to the bronchus in all except the upper right, in which case the artery lies inferior to the bronchus. The artery going to the lower lobes casts a heavy shadow on the radiograph and forms the lateral border of the radix pulmonis. Its density often causes it to be mistaken for the bronchus whereas the bronchus lying to the medial side casts a shadow of much less density with the dark shadow of its air column. In the upper lobes the multiple ramifying shadows of the artery and bronchi give an entirely different appearance to the large single trunk shadow going to the lower lobes, and are more difficult of identification.

The veins are thin-walled tubes, quite irregular in their branching, with definite tendency to be placed as far as possible from the arteries and bronchi but which in the radix pulmonis are in close apposition to the latter structures, inasmuch as the veins leave through the fossa of the hilus at a position inferior to the bronchus and artery and are often multiple, except in the right upper where the vein is superior to the bronchus. This relationship becomes important when there is a break by infection into some of the venous channels whereby the bacteria are carried to the left side of the heart and thence distributed over the body, such as occurs in miliary infection. Radiographically, these channels play quite an unimportant role.

The nerves and their plexuses need be given no consideration in this paper inasmuch as they have no bearing on the immediate situation.

To the lymphatics of the hilus region one must give first place in importance because all diseases affect the lymphatic glands more or less. Our knowledge of the location of the various nodes and the reaction of these nodes to the various diseases, either infections or tumors, becomes of basic importance.

For my purpose, I would like to divide the lymphatic glands in the region of the hilus of the lung into two main divisions:—mediastinal and broncho-pulmonary. The mediastinal group are usually further divided into (1) the paratracheal, lying along the trachea, and (2) the tracheo-bronchial, lying at the division of the trachea and the two main bronchi. These tracheo-bronchial glands are further divided into (1) the superior, lying just above each main bronchus, and (2) the inferior, lying in the angle formed by the main bronchi. The broncho-

pulmonary group are the only ones actually situated within the hilus and are more numerous than the mediastinal. They may be classified as (1) an inner group, lying along the structures in the radix pulmonis, and (2) an outer group, lying at the junction of the radix pulmonis and the lung tissue proper where the upper and lower main bronchi make their first divisions. The broncho-pulmonary group of glands discharge their material into the mediastinal group. Infection from the lower lobes comes into the lower broncho-pulmonary glands to be deposited in the inferior tracheo-bronchial glands and infection from the upper lobes comes into the upper broncho-pulmonary and finally into the superior tracheo-bronchial glands. Of all these groups the outer broncho-pulmonary as just described have the greatest importance radiographically. While surrounded by connective tissue and lying for the most part in the angle formed by the bifurcation of the bronchi they are more nearly surrounded by air and therefore become more quickly demonstrable upon enlargement. On the other hand, the glands lying along the vessels of the root proper or the mediastinal group are surrounded by larger masses of connective tissue and in the case of the mediastinal by other structures which have no differentiating densities upon the radiograph. In other words, the glands within the mediastinum or radix pulmonis must reach a size sufficiently large to encroach upon lung tissue containing air before they may be easily seen upon the radiograph. The outer group of broncho-pulmonary glands in the hilus drain all the lymphatics from the interior of the lung. For the origin and minute anatomy of these structures I would refer the reader to the excellent work of William Snow Miller<sup>5</sup>.

It must be noted that the lymphatic nodes involved correspond to the area of the interior of the lung which is affected as in other parts of the body. If one has an infection of the hand, certain glands of the arm pit will be affected. One can thereby often state what part of the lung is probably infected from the glands and within the hilus which are involved and this is often a great aid in locating lesions in the interior of the lung. The structures within the root, especially the lymphatics and connective tissue, may be directly affected by infection or tumors of the root structures or from the upper respiratory tract. This relationship with the upper respiratory tract has been traced by Mullin<sup>6</sup> as a direct lymphatic drainage through the mediastinal glands and will be more fully described later. There is a very rich anastomosis<sup>7</sup> between the lymphatics of the arteries, veins and bronchi and the various lymphatic nodes of the hilus region, and infection may spread to the opposite hilus through the mediastinum. This does not mean, however, that if one group of glands is pathological that all groups are

pathological, nor the converse, that if one group is normal that the whole hilus region is normal. I feel that one group of glands within the hilus may be normal and another group, pathological.

A reflection of the pleura surrounds the bronchus and great vessels as they enter the fossa of the hilus, binding them together and connecting them with the mediastinal structures. The structures of the radix pulmonis are further bound together by connective tissue which gives them further strength and at the same time obscures these structures on the radiograph. The structures of the radix pulmonis and connective tissues all being of about the same density are seen on the radiograph more or less as a whole with the exception of the bronchus which may be located by its air column. This connective tissue extends out especially along the artery and bronchus into each lobe and binds them together to form the linear markings on the radiograph. They are here surrounded by air and therefore become visible. The increase in connective tissue is influenced by physiological and pathological processes.

Such is the histology of the hilus of the lung without regard to age. But the structures composing the hilus are making progressive changes as the individual goes through life and at times these changes occur with considerable rapidity. For example, we would not expect the hilus to appear the same either on the radiograph or at necropsy at one year of age and at forty years of age. If one is to have any conception of what is a normal or average finding at any definite age, it becomes fundamental that he should be familiar with these changes. In other words, we must have a standard or yard-stick whereby the variations may be measured. Such information cannot be had by studying groups of children at varying ages but rather by following the same person from birth to adult life. These changes which I have called "The Progression of the Chest"<sup>8</sup> force us to still another observation. That is,—if the action and the reaction at any period of a child's life have been equal and the infection or other processes have therefore been healed, the incident becomes of no real consequence, and must be considered as just an incident in the child's life. The exception is that case in which resulting changes are rather gross and influence the surrounding structures by their actual presence. This observation in turn necessitates that the radiologist determine the character of a lesion by its actual appearance. The mere presence of a shadow such as a gland means nothing unless we can say whether it is congested, fibrous or calcified. Otherwise all radiographic work is futile, for a certain shadow may be the result of a very old process which will never be reactivated. In the very early or borderline cases where such def-

inite statements cannot be made the clinical history should be the physician's guide.

By necropsies\* at varying ages and by serial radiographs, the progressive changes of the hilus may be studied. For example, the pulmonary artery on entering the right lower lobe is found at birth to measure  $2\frac{1}{2}$  mms. and at four years, 6 mms. The bronchus at this point was likewise found to have measured  $3\frac{1}{2}$  mms. at birth and 6 mms. at four years. The structures also become denser in the course of time. The connective tissue surrounding these structures necessarily becomes heavier to withstand the greater strain thrown upon these structures. Irritations from dust particles likewise increase the connective tissue as well as the exercise of these structures such as in constant coughing. There is a fourth change in the connective tissue which we must consider as distinctly normal but which is not noted to more than a moderate extent in very young children. That is the increase in connective tissue as a result of age. A boy 15 years of age has a great deal more connective tissue than an infant, but a man 70 years of age has still more than a boy of 15. For these same reasons the radiographic shadow of the radix pulmonis becomes more extensive and denser, giving likewise increased physical findings. Radiographically, the shadows of the hilus at birth while visible are quite small whereas at four or five years of age they become surprisingly prominent and in adult life are large and well-defined.

In the progressive changes of the lymphatics, dust deposits must be considered as one of the normal changes unless by chance the dust is excessive in amount, such as in certain occupations. Infection, on the other hand, must always be viewed with suspicion and if enlarged glands are seen on the radiograph one should strive to learn their character. Certainly glands suggest disease and one cannot feel secure until they have undergone healing processes. At birth there are no macroscopic glands in the hilus. But infection soon occurs and in the average case there is a gradual enlargement of the lymph nodes in the mediastinum and along the root, extending outward to involve the outer group of broncho-pulmonary glands. As stated above, dust likewise plays a part, but in my experience infection deserves by far the greater consideration.

#### PATHOLOGY

Having reviewed the anatomy, the histology, and some of the changes that take place in the hilus normally, let us now consider the changes produced by disease. To do so I would like to describe briefly my conception of the gross pathology of the chest in order that one might have a general view as a first consideration. The diseases of the chest\* may be divided into four major groups:—tumors, infections, circulatory

disorders, and irritations. In the typical cases, each one of these groups gives symptoms and signs which are cardinal and are so recognized clinically, at necropsy, and on the radiograph. For example, the clinician will not mistake a primary tumor of the lung for a pericarditis. Likewise, the pathologist at necropsy upon opening the chest will remark immediately, "This is carcinoma," or "This is pericarditis." In like manner, these major groups may each be subdivided. For example, the group of tumors may be classed as primary and secondary, the primary tumors having still further subclasses and the secondary tumors being again subdivided into (1) those carried by the blood and (2) those carried by the lymphatics. On the radiograph or at necropsy, metastasis formed by blood deposits in the lung present an entirely different picture from that of metastasis along the lymph channels from the mediastinum into the lung by way of the hilus. The group of infections may be divided, first, into those involving primarily the hilus and bronchi such as bronchitis or bronchiectasis, and, second, those involving primarily the inner portions or the parenchyma of the lung such as pneumonia. Certainly, no one could mistake pneumonia for bronchitis on the radiograph or at necropsy. Such classifications into major and minor groups help us to form a broader and clearer view of the pathology of the chest and aid us in the formulating of cardinal signs and symptoms and likewise in their correlation.

We may now ask why there is such differentiation of the diseases of the chest in the typical cases. The anatomical considerations are of first importance. All of the blood of the body at sometime passes through the lungs and therefore a tumor in any part of the body may have metastasis in the lungs. The lungs have lymphatic anastomosis with mediastinal glands, which in turn have connections with the head and neck and the abdomen. Tumors or infections entering the lung by this route have peculiarities of their own. The lungs being the only internal organs connected with the outside air give peculiarities of disease no other organs possess. Many other anatomical peculiarities, such as the pleura, air cells, the heart and its vessels could be enumerated, and all of these have their effect upon the picture which any disease will assume.

In the case of infections, there are three major factors in the differentiation of one type from another. First, bacteria have a definite tendency to select certain tissue for their growth and development. Thus the pneumococci of pneumonia often select the parenchyma of the lungs and there produce a typical condition known as pneumonia. Certain other bacteria select the bronchi and in their development produce the congestion and catarrhal condition of bronchitis. Again, the tubercle bacillus produces primarily



the tubercle and is carried along the lymphatic channels and deposited in various lymph nodes, to produce the typical condition known as tuberculosis. Second, there is a definite tissue reaction to the various bacteria which may depend for a great part on the virulence of the particular germ. In certain acute infections where the bacteria are quite virulent and widespread there is a rapid congestion of the whole bronchial system or the production of a fulminating pneumonia, without sufficient time elapsing for much glandular increase. In most acute infections the lymphatic system does not have time to respond and when present the glands are soft, congested, show poorly on a radiograph, and disappear with the recession of the primary infection. So when the acute infection is over and the inflammation about the original site has disappeared, one does not expect to find many glands remaining to cause confusion when studying the radiograph. On the other hand, the primary<sup>10</sup> tissue reaction to the tubercle bacillus is fibrosis. The tubercle bacillus tends to grow slowly and as it develops at its original site of deposit or is carried by the lymphatics to the various lymph nodes, there is a tendency on the part of the tissue to combat it and surround the tubercles or lymph nodes with fibrous tissue. These lymph nodes then have a tendency to become discrete and as there is a longer period of time elapsing they become numerous and may be traced along their paths of drainage, and as they are surrounded by fibrous tissues they are the more readily shown upon the radiograph. Stretching from the original tubercles in the interior of the lung to the glands of the hilus, such paths of lymphatic drainage become very fundamental in the study of radiographs or the minute dissection of lungs at necropsy. Of course, there may be the fulminating type of tuberculosis with pneumonic congestion, later caseation and cavitation, but fortunately for diagnosis these cases are not common. Third, anatomical conditions affect the various types of infection. In bronchitis there is drainage by way of the bronchi resulting in cough and sputum without much adenopathy. Upper respiratory infections produce changes of the hilus which are closely limited to the radix pulmonis. On the other hand, as just described, tuberculosis involving the interior of the lung drains its infection into the hilus and produces chains of lymphatic nodes which radiate out from the hilus.

Such considerations of the pathology of the lungs, or more properly the chest, are utilized by the clinician to differentiate one disease from another. Likewise, the pathologist at necropsy states immediately from the gross appearance that this condition is pneumonia, tuberculosis, or sarcoma. Or if the condition is atypical and the appearance is confusing, he may insist upon deferring his opinion until he has studied

the microscopical sections. Likewise, the radiologist must be given the same privilege, as the radiograph endeavors to portray the anatomy and its variations, either as a result of physiology or pathology. In atypical cases, the whole situation may be confusing as a result of atypical infections or unusual tissue reactions or location of the infection. The diagnosis is then necessarily in doubt and open to question. In the very early cases before the disease has progressed and yet at a time when an accurate diagnosis is of such great importance, the cardinal signs or symptoms may still be absent and a positive diagnosis impossible. In such cases, some conception of the average condition to be expected or, stated in another way, some knowledge of what takes place in the progression of the chest is most helpful in the evaluation of the findings. Without such information, certain shadows upon the radiograph may be passed as unimportant, thus depriving the individual of further study, or the wrong positive diagnosis may be made, thereby causing considerable unnecessary expense and loss of time.

#### RADIOGRAPHIC TECHNIQUE\*

The radiologist's problem is to accurately portray upon the radiographic film the anatomical structures with their pathological variations. His results in diagnosis depend not only upon his knowledge of anatomy and pathology but to a vast extent upon his technical skill. An accurate interpretation of the shadows on the radiograph requires that an accurate and clear image be portrayed upon the film. Indefinite and vague descriptions usually mean vague and blurred films. The radiologist is continually striving to produce better radiographs and as better radiographs are produced new studies in anatomy and disease are made possible. Just as the development of the microscope has opened new fields of diagnosis, so the development of the X-Ray is playing its part.

Beginning in 1916 I have spent many years in study directed towards the overcoming of the anatomical and physiological obstacles to the production of clear radiographic films of the chest. The greatest single difficulty I found to be the intrathoracic movements which are for the most part involuntary and rather rapid. This I succeeded in portraying by taking two exposures upon the same film. Dr Ruggles<sup>11</sup> has succeeded in making a motion picture of the heart and mediastinal structures which shows very well the rocking motion of the hilus. As a result of such efforts I have found it possible to make radiographs of the chest routinely in one-twentieth of a second, which speed is found sufficient to stop the motion on the radiograph just described. In making such radiographs only one variable factor, the voltage, is used during the entire procedure. The other difficulties can likewise be overcome but it is not

the purpose of this paper to describe radiographic technique in detail. Further improvements are needed and will be made in the future and consequent greater accuracy of diagnosis will be obtained.

If the radiographic technique is accurate and the results as desired, one should clearly portray upon the film, irrespective of age and size of the patient, the following structures:—the bronchi of the hilus; the arteries; the glands, if enlarged and if not of too soft a variety; the connective tissue surrounding the bronchi and arteries, and the parenchyma of the lung surrounding all these structures in the hilus. The right hilus is shown the more easily as the left is ordinarily obscured by the heart, but a great deal can be done in portraying the left hilus. To attempt a diagnosis of any condition, one must see the structures of the hilus clearly and be able to differentiate the various grades of congestion, fibrosis or calcification. The fluoroscope is of great value especially in gross pathology and for teaching purposes, but the most minute detail can only be seen upon the radiograph.

#### SERIES

The rapid exposure in radiographic work, making it possible to radiograph the chest of any individual no matter how young, opened many fields for investigation. I think the most important one is the possibility of studying an individual's chest from birth through to adult life. Cases selected from all the walks of life and studied by this means give complete histories of those individuals that could be had in no other way. I have had the opportunity to study seventy children from birth to five years of age and while the connecting link between that and adult life is not complete, certain findings are already determined. It is impossible to describe the total series or any individual series, especially as to the minute findings. Each series varies in minute detail from every other series as any one person will vary in external appearance from any other person, due to many factors. In general however the grosser changes are similar to those described under Histology. That is, at birth the hilus, and more particularly the radix pulmonis, is a very small and a somewhat indefinite structure, frequently the main bronchi making the first division into the upper and lower branches in the fossa of the hilus. At this time the arteries are the most prominent of the structures extending out from the hilus, the bronchi being recognizable only by their small air columns. Owing to many factors, changes in the hilus soon begin and by two years of age the structures within the hilus are quite definite and even prominent. The radix pulmonis is well-formed, the connective tissue is in evidence, and in some cases glands may be seen. At four years of age the structures within the hilus may have

doubled in size and one may be surprised at the findings on the radiograph. At this time glands which may have been rather indefinite in the earlier part of the series may now be either definitely fibrous or calcified. In this manner many of the shadows about the hilus may have cleared and in others the shadows become more circumscribed and more multiple in number. At this time the hilus region approaches the appearance found later in life, but if we are to judge from groups of children seen from twelve to fifteen years of age the story is far from complete.

Evidence of the primary focus may often be seen in the first few months of life with fibrosis and calcification of the primary focus and the regional glands of the hilus. Subsequent evidence of tuberculous infection may likewise be studied. I have also been interested in the effect of acute infections upon the hilus. In looking over a considerable number in which we have had films from birth, with the incidence of measles, whooping-cough, and other acute diseases of childhood, I find that our series bear out my conclusions under Pathology, that is, after the congestion at the site of the acute infection subsides the glands and congestion at the hilus also subside and I am unable to make out any definite evidence of such infections in any of them. On the other hand, if any of these diseases assume a more chronic form or if there is a chronic infection in any part of the lung or even in the upper respiratory tract, such as tonsillitis or sinusitis, then there are definite changes at the hilus which become permanent and leave a record which cannot be effaced. The evidence of such a chronic disease is in the form of increased connective tissue, even in the pleura lining the fossa of the hilus or in the radix pulmonis and surrounding lung tissue. Such changes may at times be very gross. Changes in the lymphatics likewise assume the form first of congestive enlargement and later fibrosis and calcification. It then becomes necessary, as previously stated, in studying the hilus as portrayed by the radiograph, to endeavor to differentiate between the stages of pathology and finally to summarize the cardinal signs and correlate them with the various diseases. A rather extensive study from birth to adult life as just described appears to be necessary for our clear conception of what is actually taking place and to be the key to open the doors to many important facts.

#### PATHOLOGICAL CASES

With the thoughts and findings just described, let us now review many cases collected over a period of several years, in which we have radiographs of the chest and histories. I particularly wish to consider those which may be included in a group of chronic infections. This immediately eliminates the major groups of tumors,

circulatory disorders and dust irritations, and the division of infections which includes the acute infections. The group of chronic infections is a large and important class. Viewing it as a whole, the radiographs and histories point almost immediately to the outstanding fact that it can be divided into tuberculous and non-tuberculous classes. As one views a large number of radiographs of typical tuberculous cases, he is impressed with the evidence of increase in size of the lymphatic nodes and glands and their tendency to show different stages of the disease. In other words, the lymphatic nodes are apt to be discrete with some evidence of congestion, with fibrosis or calcification. There are radiating lines extending out from the hilus, but along these lines composed of the arteries and the bronchi, bound together by connective tissue, there are these lymphatic nodes with regional groups of involved glands in and about the radix pulmonis, giving a beaded appearance which has been so often noted by various writers. Clinically, the patients showing this type of a radiograph are definitely underweight, usually have a slight and variable increase in their temperature, and there is malaise in the adult or nervousness in the child.

The outstanding feature of the radiograph in a typical non-tuberculous case is the absence of the discrete glands described in the tuberculous, and in its place the evidence of connective tissue increase. The radix pulmonis shows masses of connective tissue without well-defined glands and the radiating lines extending out from the hilus show connective tissue increase with thickening of the walls of the bronchi, but the lymphatic nodes are not prominent. If there is an upper respiratory infection, the connective tissue increase about the radix pulmonis may be unusually prominent. An empyema associated with mediastinal pleural involvement may produce bands of fibrosis, distorting the hilus, or an abscess may cause similar evidence of gross pathology, but in its typical form the radiograph does not resemble that found in the tuberculous patient. Clinically, this class of patients are more apt to be well-nourished or even overweight, rather than underweight, their rise of temperature is not so definite, and they have less malaise and more tendency to cough.

Due to various factors, in the atypical cases of the chronic infections these two groups of the tuberculous and non-tuberculous may be blended. For example, there may be sinus infection which is quite active and a tuberculous infection of the lungs which is rather inactive. The changes at the hilus of the lung would then be influenced by both conditions, and a positive diagnosis in such a case may be impossible. In the atypical case, the greatest shrewdness is necessary and care must be exercised that one does not endeavor to make too definite statements as to the etiology.

# SUMMARY

It is to be noted in summarizing the investigations presented in this paper that I have given most consideration to the subject of chronic infections. This is probably due to the fact that in private practice I have found that this group is a large and very puzzling one. To make a diagnosis that even approaches accuracy at times gives one the greatest concern. A primary carcinoma originating in the main bronchus or the radix pulmonis may produce changes within the hilus which may simulate other pathology. However, fortunately these cases are very rare in this particular location. Hodgkins disease and tumors of the lympho-sarcoma group may give nodes within the hilus, but usually they have a different appearance than the glands associated with tuberculosis and we do not find the radiating lines extending out from the hilus which are so typical of the infections. Then again there are the clinical and laboratory findings to help differentiate this group of patients. The other primary and secondary tumors are usually rather easy to diagnose. For such reasons I have not gone carefully into the tumor group. For similar reasons the group of circulatory disturbances have been given little consideration. The changes within the hilus produced by them are usually quite evident.

The group of irritants of which dust, in its various forms, constitutes the largest factors may simulate very closely the infections and should always be considered in that connection. In their early stages they do not usually come in for diagnosis and in the atypical cases a positive diagnosis is often impossible. In the typical cases and the more advanced ones there is evidence of connective tissue increase without definite bronchial thickening, and while the glands show enlargement with fibrosis they do not assume quite the same appearance as in tuberculosis, and the lesions within the interior of the lung assume the interstitial type of fibrosis. Again, the clinical history and findings are the deciding factors in the diagnosis.

This then leaves for our most careful consideration the group of infections. As stated under Pathology, it has not been my observation that the acute infections leave many traces in the hilus and usually they are not difficult of diagnosis. It is true an abscess in the hilus may be confused with pneumonia but not for very long.

The subacute or chronic infections may be divided into three classes: early, atypical and typical. In the early cases the signs on the radiograph are usually not sufficiently advanced so that the radiologist can classify them. It is possible for him to state only that certain pathology exists. The clinician and the pathologist likewise ask for similar privileges in these cases and after all it seems to be the clinician's respon-

sibility to correlate the various findings from the laboratory and the radiologist into a probable diagnosis. Greater understanding of changes in the hilus of the lung and improvements in radiographic technique will enable the radiologist to be of greater help.

The atypical cases are atypical because of the blending of the factors of anatomy, tissue reaction, and the selection of tissue by the various bacteria. Again the radiologist would do well to state what pathology exists, something as to the possible etiology, and then leave the rest to the clinician.

Fortunately, a large number of cases fall into the class in which the signs on the radiograph are fairly typical and I believe it is also true that most cases which show clinical symptoms have radiographic findings. I note in Canti's<sup>7</sup> report that he mentions the enlargement of the broncho-pulmonary group of glands associated with the primary focus in the interior of the lung almost constantly with enlargement of the mediastinal group. And Griffith<sup>12</sup> speaks of the glands extending out along the second division of the bronchi as being associated with early infections. In my own experience the outer group of the broncho-pulmonary glands are of the greatest importance in diagnosis of conditions in and about the hilus. Dunham feels that these glands should always be connected with the lesions in the interior of the lung before passing an opinion as to their tuberculous character. Mullin<sup>6</sup> has described the connection of the sinuses with the roots of the lung by way of the lymphatics and demonstrates that infection may travel from the sinuses to the root of the lung in this manner. Certainly, the regional glands within the hilus indicate the area in the interior of the lung that is involved, and if there is only one area and only one group of these regional glands involved, it does not look like bronchitis, but rather (as described by Ghon<sup>13</sup>) a primary tuberculous process, especially when found in children. On the other hand, a radiograph with considerable connective tissue increase about the radix pulmonis without much enlargement of the outer broncho-pulmonary group of glands and without the usual radiating lines extending into the interior of the lung looks like an upper respiratory infection, especially when associated with sinusitis or chronic infection of the tonsils. Only occasionally does a tuberculous process extending across the mediastinum to the opposite hilus give a radiographic picture resembling it and here the resemblance is probably due to the extension of the process from the mediastinum into the hilus rather than from the interior of the lung into the hilus. But here again the radiographic findings of the sinuses or the tonsil examination give the differentiating points. I have found this to be especially true in children. Later as the

pathology in the hilus in this particular type of cases increases the congestion and connective tissue increase may extend out along the bronchi and then produce the radiating lines, and then the findings resemble those in bronchitis.

Finally, I have been very much impressed with how early in infancy findings may be had which later develop into the chronic ailments of childhood or adult life. The early findings of infection and congestion of the bronchial system bear out Woodhead's<sup>14</sup> statement that catarrh and congestion of the mucous membrane of the bronchi give the proper soil for tuberculosis. Certainly, it is very fascinating to watch the beginning of a bronchitis at one month of age and note its gradual development until it is definitely marked at four years of age, with evidence of sinus infection associated with the progress of the bronchitis. At least in the non-tuberculous types of cases sinus infection and less often tonsillar infection is of especial importance. For the proper understanding of these conditions or for an accurate diagnosis the basis must be the progression of the chest.

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- 12 Diseases of Infants and Children. Griffith. Vol. 2, p. 501. W. B. Saunders & Co., Phila., 1919.
- 13 Der Primäre Lungenherd bei der Tuberkulose der Kinder. Dr. Anton Ghon. Urban, Berlin, 1912.
- 14 Morbid Anatomy and Histology of Pulmonary Tuberculosis in Relation to Its General Pathology and Clinical Manifestations. G. Sims Woodhead, M.D. Medical News, Vol. 84, 1904.

#### DISCUSSION

DR. GERALD HOFFEL (Boston): Dr. Wasson in his researches these past several years has followed a very unique and noteworthy program. I am sure that time has not enabled him to tell us all that he has accomplished but anyone familiar with his publications knows that he is obtaining information that will be a great contribution to our knowledge of chest pathology.

His work is especially interesting to the pediatrician. One of the great problems that



confronts us at this time is the large and ever increasing group of children that is being isolated from the schools and clinics because of factors in their histories and physical states that require careful and painstaking study in order that a diagnosis and satisfactory treatment be established. This group consists largely of patients who have varying degrees of undernutrition; others in addition have a positive history of exposure to tuberculosis or the tuberculin reaction is positive. Recurrent and chronic respiratory infection is especially noted in their histories.

The clinician in order to thoroughly study these patients has been resorting to the use of the x-ray to discover or corroborate his suspicions that pathology exists in the lower respiratory tract of such a nature as to account for the symptoms. As a consequence of this frequent use of the radiogram a comparatively new problem has been made in medical diagnosis. The roentgenologist and clinician are now confronted with the problem of correctly interpreting and evaluating the various markings and shadows that might be found to exist either in the region of the hilum or out in the lung fields. We know that chronic respiratory infections, tuberculosis and various other diseases may leave scars of a temporary or permanent nature in the lung and its vicinity. They may be of great or of slight significance but nevertheless when portrayed upon the x-ray plate they must be satisfactorily explained and identified. We have come to the conclusion at the Children's Hospital, where this group of patients has been referred to a special clinic, that only through close coöperation between the clinician and roentgenologist can the importance of the lesion, its identification and opinion concerning its severity be obtained.

The work that Dr. Wasson has been doing in the serial studies of the chest is impressive and justifies the attitude we have taken in the control of these patients. It is important to emphasize how frequently we are not able with one examination, physically and by the roentgen rays, to make any decisive conclusions as to the diagnosis or prognosis, but it is only after a careful study of the history, physical examination and repeated interval x-ray examinations that we are able to dispose of patients belonging to this large group to their best advantage.

DR. MARTIN J. ENGLISH (Boston): *Mr. Chairman, and Ladies and Gentlemen:* I think Dr. Wasson deserves a great deal of commendation for this very exhaustive, thorough and complete talk on the hilus of the lung. It is an unexplored territory. I don't know of any article or textbook upon anatomy that has been written that has shown the anatomy of the hilus any better than these photographs.

I can just recommend that if anyone is interested in this particular part of the human be-

ing that he refer to the reprint in November 1925 of the *Journal of Radiology*. I think it is very interesting not only to those interested in radiology but also to those interested in clinical medicine or pediatrics. He has described very concisely and thoroughly the anatomy of the structures in the hilus of the lung. He has taken photographs anti-mortemly and post-mortemly. He has inflated the lungs and veins so that you get a very accurate picture.

You can see where to the pediatrician to diagnose things in that region would be difficult. You have sternum and the cartilage at that particular point. You have the spinal column behind, so that methods of detection by the ordinary routine methods of diagnosis, by inspection, by palpation, by percussion, by auscultation, are practically nil. Consequently, we have to lean upon the radiologist or roentgenologist for practically the end result as far as diagnosis is concerned. We take the history and do the physical examination. We depend on laboratory methods. We have to use the x-ray as a more precise and more accurate method of precision than anything in our clinical pediatric armamentaria.

The disease with which the pediatrician is concerned with in that region are, as Dr. Wasson has said, the acute infections. The child has a chronic cough, the cough of the catarrhal cold. It remains two or three weeks without temperature.

In the question of tuberculosis as distinguished between chronic infection of the mediastinum and particularly the hilus of the lung, the history, of course, is very important and the physical examination doesn't help very much in pathology in that particular region. Of course, the pediatrician has to deal with tumor of the mediastinum. Such tumors occur usually, of course, in adults. He doesn't have to deal with dilatation of the aorta, which is more common in the adult. He doesn't have to deal with the tremendous aortic hearts, the big pathological parts. He is dealing more with the congenital type of heart or the acquired heart that is not usually seen previous to the second or third year.

We are very much concerned with the question of tuberculosis of the hilus of the lung and how it can be diagnosed accurately so that we can dispel any fear on the part of the parents or friends. The diagnosis of that condition, of course, is made by a careful history, by physical examination which often doesn't help, and the progress of the infection over a period of weeks and months.

I think Dr. Wasson has clarified this situation tremendously today by the microphotographs that he has shown, and our exact diagnosis in the determination of the differentiation between acute infection of the hilus non-tubercular, tubercular, and those that are to be determined more and more through the x-ray examination.

Whether some of us are not only interested in the diagnosis of things connected with the hilus, but also in the things connected with the treatment, I think we have to depend again upon the radiologist in addition to fresh air, sunshine, food of good quality, and rest. I think those cases are distinctly helped by radiations upon the front and back of the chest to decrease a great many of those hilus glands.

We are at a great loss in diagnosis and I am quite certain that from my point of view Dr. Wasson has clarified this field not only from the anatomical and etiological point of view, but distinctly from a clinical diagnostic point of view.

CHAIRMAN GRANGER: The next order of business is the report of the Nominating Committee.

DR. A. L. BROWN (Winchester): *Mr. Chairman and Fellows:* It gives me a great deal of pleasure to announce the disposition of the Nominating Committee as recommending Dr. Frederick W. O'Brien, of Boston, as Chairman of this Section for the ensuing year and Dr. William D. McFee of Haverhill, as Secretary.

CHAIRMAN GRANGER: Are there further nominations?

Upon motion regularly moved and seconded it was voted that the Secretary be instructed to cast one ballot for the names as reported by the Nominating Committee. The Secretary cast the ballot and Chairman Granger declared Dr. O'Brien elected Chairman and Dr. McFee elected Secretary for the ensuing year. (Applause.)

CHAIRMAN GRANGER: We shall not be able to hear the paper on "Effect of Radiation on Cell Activity," Dr. W. T. Bovie having been called away.

Dr. William L. Clark, of Philadelphia, is also unable to be with us to give his paper on "Electrothermic Methods in Surgery," but Dr. Grant E. Ward, an associate of Dr. Kelley, of Baltimore, has come to our rescue. Dr. Ward, you may have twenty minutes.

### IMPORTANT CONSIDERATIONS OF ELECTRO-SURGERY

BY GRANT E. WARD, M.D.

WE all regret very much that Dr. Clark, who is considered the American father of electro-surgery, is not with us. I have been looking forward to hearing him today and not until Saturday did I have to forego that pleasant an-

ticipation when I received a telegram from Dr. Granger asking me to use Dr. Clark's time.

In speaking to one of your members before the meeting this morning, I asked in what phase of this work you would be most interested and he suggested that I emphasize the electrical principles, technic and their importance.

Not long ago in one of the Medical Journals a surgeon who is employing electrothermic methods, intimated that it isn't necessary for the operator to be familiar with the physical principles of the currents but simply to know how to work the machine. That sounds all right superficially, but on second thought we realize that it is as important to be thoroughly cognizant of the currents and their physical and biological properties as it is to understand the physiological actions of drugs we prescribe. For this reason I will emphasize the electrical principles of the various high frequency currents and describe their effects on tissue. The text is chiefly descriptive of the illustrations.

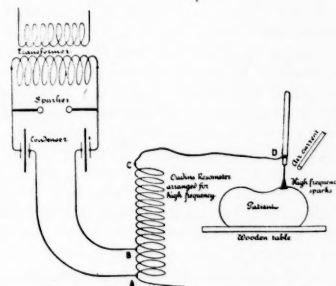


FIG. 603.—APPARATUS FOR RADIATIONS AND HIGH-FREQUENCY SPARKING (HIGH TENSION). (FELGERATION.)

FIGURE 1

Figure 1 is a drawing taken from Doyen, illustrating the apparatus producing the fulguration current. The main difference between currents produced by this and the present-day apparatuses is a larger amount of amperage giving deeper heat-penetration with the newer ones. The old fulguration machines produced a high voltage and high frequency but low amperage. The transformer, spark gap, and condenser is shown attached in circuit with an Oudin coil.

The second diagram illustrates Doyen's modification. Instead of having a solenoid (Oudin Coil) with the current taken off at one end, he used the entire coil as a secondary coil taking

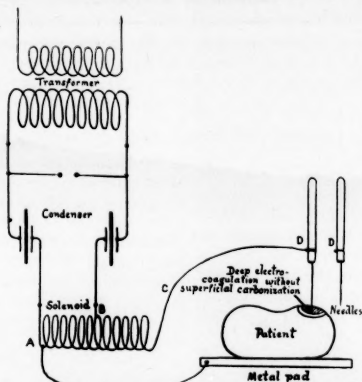
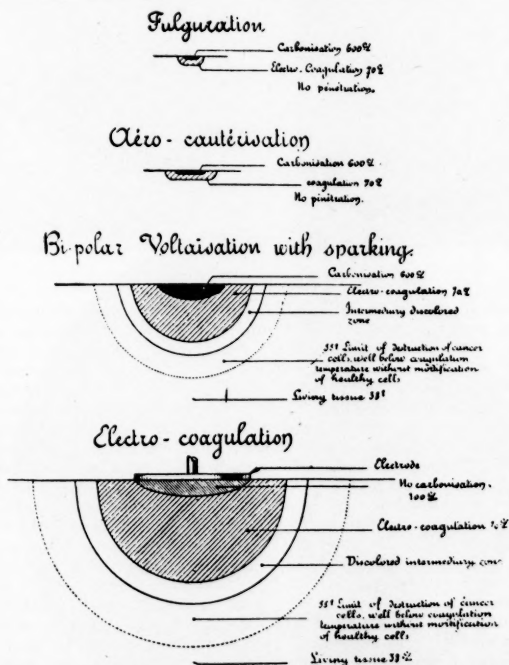


Fig. 2.—Electrical principles of our present electrothermic or electrocoagulation machines. The current from the transformer-condenser circuit passes through *A B*, the primary coil of the resonator (solenoid) as in Figure 1. The current for therapeutic use is here bipolar, being taken from the resonator at *A* and *C*, utilizing the entire coil as a secondary one. *A* is connected by a wire to the inactive electrode placed beneath the patient, and *C* to the needle *D*, the active electrode. The deep penetration of the electrocoagulation, in contrast with the shallow action of fulguration, may be noted.

FIGURE 2



SECTION REPRESENTING THE RESPECTIVE EFFECTS PRODUCED ON A PIECE OF MEAT IN ONE MINUTE BY THE SEVERAL PROCEDURES.

FIGURE 3

off at both ends producing a bipolar current. He termed the effect of this current bipolar voltaization and later electro-coagulation.

Figure 3 is a diagram illustrating the affects of heat produced by various methods and their relative penetrations including fulguration, aero-cauterization, bipolar voltaization with sparking and electro-coagulation. Charring as obtained with the actual cautery and bipolar voltaization with sparking (Doyen) prevents the further deep penetration of heat. If the electrode is placed next to the skin, the area of dehydration and coagulation extends to a much greater depth being more effective in destroying malignant disease.

The accuser current is an entirely different one than the first two which I discussed. The coagulation current is damped one of high voltage and amperage, but the accuser current from radio tubes is undamped and of a lower voltage and amperage, and a higher frequency. The oscillations of the coagulation and desiccation currents are of unequal intensity being broken by a return of the current to the normal line, the type of current used in the x-ray. The accuser current coming from two radio tubes, is of equal intensity and equal oscillation bombarding the complex protein and fat molecules, breaking them down into carbon. This is termed molecular disintegration. The action of the electro-coagulation and desiccation currents is

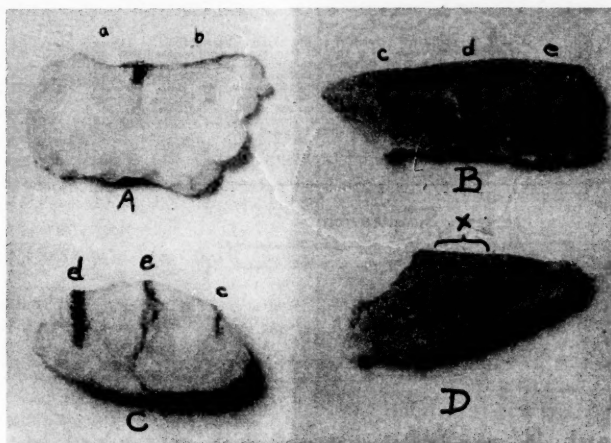


FIGURE 4

This composite picture illustrates the effect of the electric current on various tissues. A is a piece of abdominal fat. The needle was inserted and a current of 700 milliamperes allowed to run for a minute. The carbonization present prevented further penetration of the heat. If the technic is altered and the needle moved from place to place, a solid block of coagulated tissue is obtained as in D, at X. The needle was left in place one minute in B. at d, for half a minute at e, and fifteen seconds at c. B. is a piece of beef muscle and C a piece of fibroid tumor. After the experiment was done, I used a scalpel to cut through part (a) of the specimen A and endotherm knife or accuser, as Dr. Kelley calls it, to cut the remainder (b). There is a thin layer of bronzing or carbonization along the edge one-tenth of a millimeter in depth. This does not prevent primary union and it is this type of current used for breast amputations, laparotomies, etc.

due to heat developed within the tissues. The difference between desiccation and coagulation is one of heat intensity and penetration in the first dehydrating, in the second actually coagulating tissue into a homogeneous white mass.

There are some apparatuses which produce a cutting current with spark gap connection without using radio tubes. The current is a very rapidly oscillating damped one with a short wave length each group of oscillations being superimposed on the preceding group simulating the current from radio tubes. This current also severs tissue quite as well as the true undamped current but one must guard more carefully against too much heat (amperage) with consequent deep coagulation and nonunion.

Figure 5 is photograph of the type of electrode which I prefer to use. The tip is unscrewed illustrating the attachment of the needle. One can interchange the needles using any type desired to work around various points



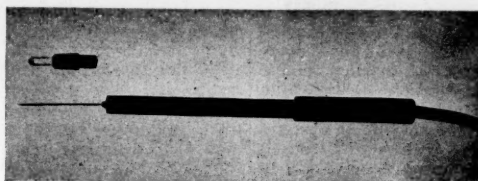


FIGURE 5



FIGURE 6

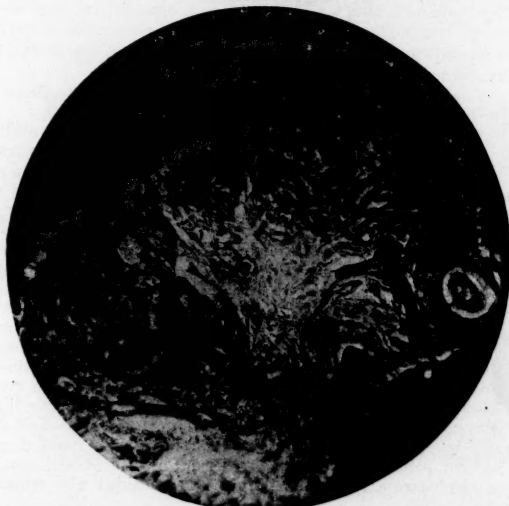


FIGURE 7

or in cavities or under surface tumors where a straight needle is cumbersome.

Figure 6 is a photomicrograph of the desiccating or dehydrating effects of certain high frequency currents. Dehydration or desiccation may be effected by a bipolar or monopolar current, depending upon the amount of heat developed and the duration of the application. It is usually accomplished by a monopolar current the cells here becoming drawn out and spindle-shaped with elongated nuclei. This section is of a basal cell epithelioma; note the stroma cells

ant points in the technique of the treatment of malignancies in accessible locations as the skin, tongue, lip, cheek, etc.

The first step is to throw a line of coagulation around and when possible beneath the tumor. This is more important in large tumors involving the cheek, buccal mucosa, or the tongue, as by so doing one cuts off circulation of blood and lymph from the part preventing dissemination of malignant cells and allowing necropsy without danger. After throwing a line of coagulation around the tumor, it becomes purple, in-



FIGURE 8

are also elongated, shriveled, and dried up, in many instances hardly discernible from the tumor cells.

Figure 7 illustrates the coagulation effect of the bipolar damped current. Note that the stroma cells have become hyalinized while the groups of tumor cells are converted into homogeneous masses taking a deep basic stain. The entire coagulated area grossly appears as a white "cooked" mass of tissue. At the side of the picture there is a blood vessel filled with clot. If allowed to remain in situ this would be replaced by a thrombus except for the sloughing away of the outer portion.

A photomicrograph illustrating the effect of the endotherm knife or accusector. A thin layer of carbonization is seen along the edge and a slight amount of desiccation and coagulation back of this due to the heat developed in the passage of current through the tissues. The width of these two zones is one-tenth of a millimeter and does not prevent primary union.

I would now like to emphasize a few import-

dicating the blocking of the blood and lymph flow.

The second step is to thoroughly destroy the growth itself.

The third consists of curetting away the already coagulated or dehydrated tissues after which the base is treated by a dehydrating spark so that in the days to follow a perfectly sterile crust protects the underlying structures. In seven to ten days the slough comes away leaving a surface covered with rapidly growing granulations over which epithelialization quickly takes place. To prevent secondary hemorrhage from sloughing in the mouth the adjoining large vessels are previously ligated and a 1% sodium hypochlorite solution is used as a topical application twice a day. This hardens the slough.

Figures 9 and 10 show a case of basal cell epithelioma of the lower eye lid. After substantial radon treatment a small area of disease lingered. There was marked reaction from this treatment associated with conjunctivitis. When this had subsided the remaining growth was

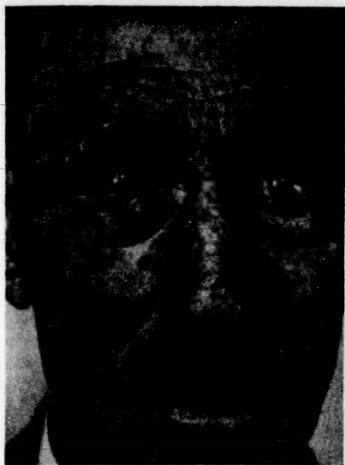


FIGURE 9

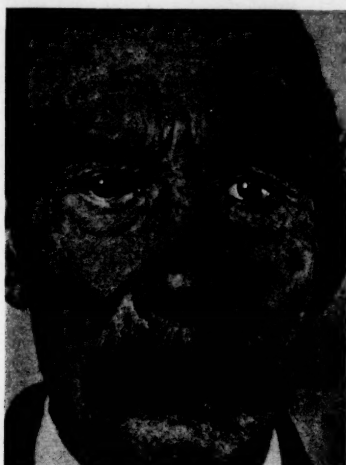


FIGURE 10

destroyed with a desiccating current. Following the desiccation there was a strikingly small amount of reaction and prompt healing.

Figures 11 and 12 show a case of keloids of the abdomen which recurred after several operations and was resistant to radon therapy. The technic of treatment consisted of excision with the endotherm knife and coagulation of the base of the tumors. The patient is a man from along the coast of North Carolina, and sent me a second photograph after healing had been complete. He had been well for two or three years.

Figure 13 illustrates the treatment of epithelial lined cavities as represented by a case of ranula indicating how we have branched out

from the treatment of malignancy and use electrothermic methods in other lesions. A young woman came with a tumor on the left floor of the mouth reaching back to the anterior pillar, and not wishing to submit her to a long, bloody dissection, I used the usual conservative methods without benefit. Then electrothermic methods came to the rescue. The cyst was opened with the accusetor under local anaesthesia and the epithelial lining destroyed by electro-desiccation. Prompt healing occurred in about 10 days leaving a soft pliable and almost invisible scar. A year later a smaller cyst appeared on the opposite side. This was treated in like manner with a similar result. This splendid result with



FIGURE 11

a rather simple technic as compared with the usual long drawn-out bloody and oft times disfiguring operation with the scalpel led to the use of high frequency currents in other cystic



FIGURE 12

tumors and post operative ventral hernias. Small cysts of the ovary can be evacuated and their walls destroyed. Obliteration with catgut sutures then permits prompt healing.

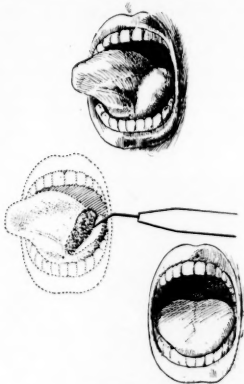


FIGURE 13

In cases of larger tumors densely adherent to the intestines it is much simpler and shorter to destroy the lining especially if malignant and leave it in situ rather than to attempt a long and dangerous resection. In post operative ventral hernias the mouth of the sac is closed and the walls left in place. The epithelial lining is then destroyed with the desiccating current. The

wound is closed in layers as usual without attention to the now dead and harmless sac. The desiccated tissue is absorbed as the wound heals with splendid result.

CHAIRMAN GRANGER: Dr. Francis Williams, will you say one word to us? He is the father of us all in radiation therapy and radiology.

DR. FRANCIS H. WILLIAMS (Boston): Mr. Chairman and Gentlemen—I am very glad to have an opportunity to express my appreciation of the work that Dr. Wasson is doing.

There is a suggestion I should like to make regarding the use of the x-rays and that is the desirability of examining certain chest cases, for example, with a mechanical stereoscopic fluoroscope. One was used for some years at the Boston City Hospital and was so made as not to be dangerous to the observer.

CHAIRMAN GRANGER: The meeting stands adjourned.

The meeting adjourned at eleven fifty-five o'clock.

#### THE WORLD'S CHILDREN

WEEKLY NOTES ON CHILD WELFARE TOPICS COMPILED  
BY THE U. S. CHILDREN'S BUREAU

##### *Proposed Revision of Washington, D. C., Child-Labor Law*

Soon after the opening of Congress in December bills were introduced in the House of Representatives and the Senate forbidding all gainful employment of children under 14 years of age in the District of Columbia, except in housework or agricultural work performed outside school hours for the child's parent or legal guardian; providing for an 8-hour day and 48-hour week for employed children between the ages of 14 and 18; improving the provision of the present law regarding street trading and dangerous occupations; and strengthening the measures for the enforcement of the present child-labor law.

##### *Fund for the Study of Infantile Paralysis*

An anonymous friend of the University of California has promised \$5,000 a year during his life and a fund of \$100,000 by his will to be devoted to the prevention and cure of infantile paralysis. The fund, however, may be diverted to combat any serious epidemic which threatens the lives of the children of the State.

##### *Georgia Now in Birth and Death Registration Areas*

Georgia has been admitted to the birth and death registration areas of the United States. This has reduced to five the number of States outside the death-registration area, and to seven the number outside the birth-registration area.

##### *Traveling Milk Laboratory, New Mexico*

A traveling milk laboratory lent to New Mexico by the American Child Health Association for two months last fall, made possible the first systematic study of the State's milk supply. Very little of the milk was found to be pasteurized, and there was wide variation in bacterial counts. The State health officer reports a strong sentiment in favor of continuing milk tests by means of a traveling laboratory maintained by the State, which would be especially useful in serving the many small towns which can not afford to maintain laboratories of their own.



## ORIGINAL ARTICLES

### THE COMPARATIVE EFFICIENCY OF SOURCES OF RADIATION USED IN THERAPY\*

BY DR. W. T. BOVIE

#### INTRODUCTION

**D**URING the past year the Committee on Public Health of the Massachusetts Medical Society has been directing a study of the effect of various forms of radiant energy with view especially to adding to present knowledge the therapeutic usefulness of so-called ultra-violet lamps.

A preliminary report covering actual clinical experiences based on answers to over 1600 questionnaires was presented at the annual meeting of the Society on June 8, 1927, and subsequently published in the *Proceedings of the Council and in the BOSTON MEDICAL AND SURGICAL JOURNAL* of June 30, 1927 (Vol. 196, No. 26).

The uncertainty with respect to the quantity, quality and character of the radiations given off by lamps in actual use by physicians as indicated by the experience of physicians responding to the Committee's questionnaire led to the preparation of this article by Dr. Bovie at the request of the Committee.

The efficiency of sources of radiation like all other kinds of efficiency is measured by the ratio of the output to the input. The illuminating engineer measures the input of sources of light in watts and the output in lumens. He may often leave out of account the cost of installation and replacement as insignificant expenditures in comparison with the current consumption. Likewise the clinician must measure the efficiency of the sources which he uses as a ratio of the output to the input. For him however, the input cost must be made up of a large number of items of which wattage is usually of least importance, while the output must be measured in units of physiologic and therapeutic effects. Unfortunately most of his items of input and output cannot be assigned fixed numerical values, for their relative importance varies with the conditions met with in each case. Sunlight, for example, is usually not an inexpensive source for therapeutic purposes, for at its best it has serious drawbacks. Few people can afford to go for treatment to places favored by an abundance of sunshine, and even in a climate approximating the ideal neither the intensity nor the quality of sunlight is constant, and moreover the clinician has no means of measuring or controlling the fluctuations. The dosage must always remain unmeasured.

\*From the Department of Biophysics, Northwestern University Medical School, Chicago.

Nils Finsen found the sun at Copenhagen an inefficient source for the treatment of lupus. The hospital expenses during the indeterminate cloudy days between exposures and the impossibility of prosecuting a course of treatment in the manner demanded by the case forced him to develop a source which was more efficient. He experimented with the carbon arc until he developed a source of therapeutically active ultraviolet radiations efficient enough for treatments provided he concentrated its rays with lenses. But the quality of the radiations of his carbon arc was quite different from that of sunlight. There was present a greater fraction of the long invisible heat rays than is found in sunlight and in order to prevent burning his patient he was obliged to filter these rays out by passing the beam of light through quartz-windowed cells containing running water. In addition the carbon arc also emitted radiations shorter in wavelength than those found in sunlight, but this he found a distinct advantage because when these rays were included his patients did not tan as much as they did when exposed to sunlight and effective treatments could be continued much longer.

Finsen's experiences with sunlight and the carbon arc are recounted in order to bring out by concrete example the complexity of the problem of evaluating the efficiency of a source of radiation in therapeutic practice.

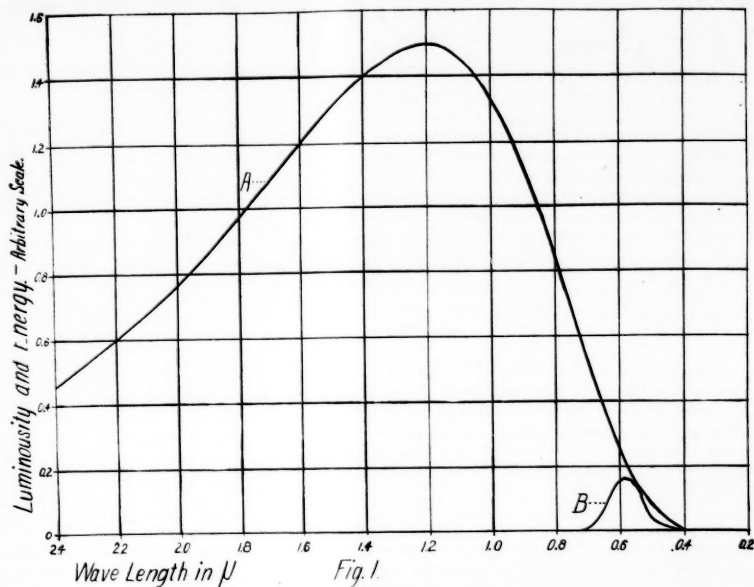
Further, we may be quite certain that many an unknown physiologic effect produced by radiation has yet to be discovered, and the physiologic effects already known have not been studied sufficiently to enable us to state the quantitative relations existing between exposure and effect; so far our experiments reveal but vaguely the kinds of radiation which are able to bring about a desired physiologic response. It is not surprising therefore that the clinician's choice of a lamp is often determined by the persuasiveness of the salesman.

If therapeutic practice is to rest on anything other than clinical empiricism we must have clear notions of the characteristics of the radiant sources at our disposal for only with such knowledge may we determine the most suitable source for treating various conditions. We need to consider both quantity and quality of the radiation which the source emits and we may not limit our inquiry to the quantity of only those wavelengths which experience has shown to be therapeutically effective for, as in Finsen's case cited above, there may be undesirable kinds of rays which must be eliminated and the me-

chanics of the filtering process may so seriously complicate the method of treatment as in itself to condemn the source as inefficient and undesirable.

This may be nicely illustrated by the incandescent lamp with a tungsten filament.

curve B has to be determined by an indirect method, and certain assumptions have to be made in fixing its absolute height. For obtaining the data for curve B, advantage is taken of the fact that it is possible for the eye to determine when two beams of light in juxtaposition and simultaneously falling on the retina, are of equal intensity.



Curve A in figure 1 is the spectral energy curve of the radiations of a tungsten filament and curve B of the same figure represents the spectral luminosity curve of this source. In this figure, wavelengths are measured in microns along the horizontal axis and the energy and luminosity values are measured in arbitrary units along the vertical. The data for plotting curve A were obtained with a spectroscope, the telescope of which was equipped with a linear thermopile. The dimensions of the thermopile were such that it intercepted only a small region of the spectrum. The thermopile takes advantage of the heating effect of the rays. Its variable junction is warmed and the thermoelectromotive force developed is measured by means of a galvanometer. From the deflections of this instrument the energy of the radiation for each spectral region is determined.

It will be seen therefore that the height of curve A above the horizontal axis is proportional to the heating effect of the radiation, and the area under it is therefore a measure of the heating effect of the total radiation of all wavelengths emitted by the source.

Now since it is impossible for the eye to measure absolute intensities the height of the

position and simultaneously falling on the retina, are of equal intensity. The instrument used is a spectrophotometer. The absolute height of the curve is determined by the assumption that the eye works with 100 p. c. efficiency, i. e. that it utilizes all of the spectral energy for the wavelength for which it is most sensitive, and curve B is drawn tangent to curve A at this wavelength. The area under curve B represents the total physiologic effect produced in the retina by these rays.

A comparison of the areas under curves A and B brings out very clearly how inefficient the incandescent lamp is as a source of visible radiation and further that most of the radiant energy given out by the tungsten filament has wavelengths lying in the infrared or heat region of the spectrum. The tungsten lamp therefore is essentially a source of heat, and not a source of light, and when used for therapeutic purposes these facts must be taken into consideration for if a source adequate to furnish a significant amount of light is employed some means must be provided for dissipating the excess heat and filtering mechanisms must be used.

Curve B is interesting because it depicts a physiologic effect of radiation and it is prac-

tically the only physiologic effect which has been measured with anything like precision. It has characteristics which undoubtedly will be found in curves of other physiologic effects when they have been sufficiently investigated.

The curve rises to a maximum at a certain spectral region, ( $0.58\mu$ ) and on either side of this region it falls off until it reaches the horizontal axis. All wavelengths on the horizontal axis under the curve contribute to the physiologic effect and we look forward to the time when similar sensitivity curves can be drawn for each therapeutic effect of radiation. Research in this field cannot be considered complete until such data are available.

As in this paper we are primarily interested in ultraviolet therapy, the ultraviolet end of

sale of incandescent lamps for therapeutic purposes, as evidence that the lamp may be used as a source of ultraviolet radiations. It is obvious however from the figure that the fraction of ultraviolet radiations of wavelengths shorter than  $0.35\mu$  is so small as to be insignificant and of no known therapeutic value.

Curve B is the spectral luminosity curve shown in figure 1.

Curve C shows the spectral photographic action of the radiation from the tungsten filament. As will be seen this curve has two maxima. The height of this curve has been fixed by assuming that at the wavelength of the higher maximum the photographic plate is 100 p. c. efficient; that is, that all of the available energy of this wavelength is utilized in changing the photo-

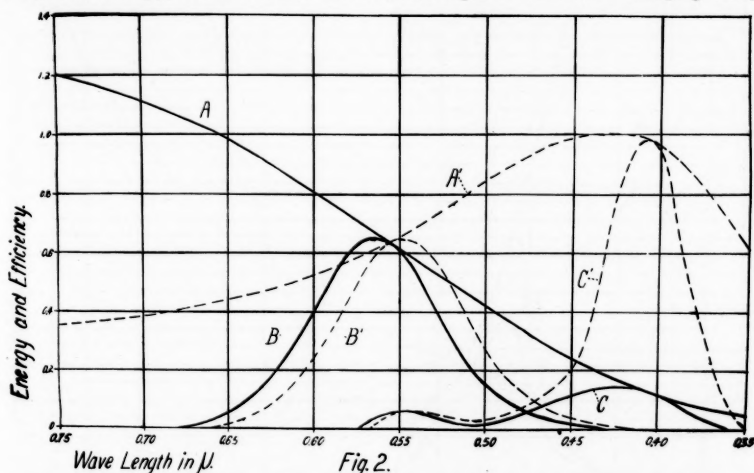


Fig. 2.

figure 1 is plotted on a larger scale in figure 2 and for comparison some other curves have been included in the same figure. It can be seen when plotted on the larger scale that the spectral energy curve of the tungsten filament (curve A) does not reach the horizontal axis at any wavelength shown in the figure.

If figure 2 had been drawn so as to include the spectral region lying farther into the ultraviolet it would have shown that the spectral energy curve does not fall to the horizontal axis until it reaches a spectral region lying below the limit of the solar spectrum ( $0.29\mu$ ), for a photograph of the spectrum of the light from a tungsten incandescent lamp always shows a spectrum extending into the ultraviolet beyond the limits of the solar spectrum, providing the glass bulb is not too thick and the slit of the spectroscope is opened wide enough and an exposure of sufficient length is given. This fact has often been used by those interested in the

graphic film to a developable condition. The area under curve C is of course a measure of the total photochemical action of the radiations from the incandescent filament as measured by the photographic plate.

It will be seen that as far as photography is concerned this lamp is even less efficient than it is for illuminating purposes, since the area under curve C is less than the area under B.

There is also drawn in figure 2 the spectral energy curve for the blue sky (curve A') and associated with it is a spectral luminosity curve for the blue sky (curve B'), and a spectral photographic action curve of the radiations of blue sky (curve C'). Curve A' has its maximum nearer the blue end of the spectrum than is the case with the incandescent lamp and the spectral luminosity curve which is drawn tangent to A' at a wavelength corresponding to the maximum sensitivity of the eye, is shifted toward the blue end of the spectrum. This

shifting of the luminosity curve is in agreement with the fact that sky light appears "whiter" to our eyes than does light from an incandescent lamp.

Since we are interested in the photochemical action of the rays a comparison of curves C and C' is particularly interesting. Like curve C, C' has two maxima, but the short wavelength maximum mounts to a much greater height than does the corresponding maximum of curve C because in blue sky light there are available more photochemically active rays.

The area under curve C' is much greater than that under C. This is in agreement with the fact that the blue sky is a much more efficient source for photographic purposes than is

enough so that its photographic action would be equal to that of the blue sky and then the area under C would have been equal to that under C' (likewise the intensity of the light might have been increased by moving up nearer to the source). But in any case it must be remembered that the amount of heat radiation would also have been increased and our heat filters would have had to have a correspondingly greater capacity. Thus the relationships which we are trying to bring out here would not have been altered.

At this point in writing the paper I am greatly embarrassed because of the dearth of comparable and useful data. I should like reliable and precise data of the energy distribu-

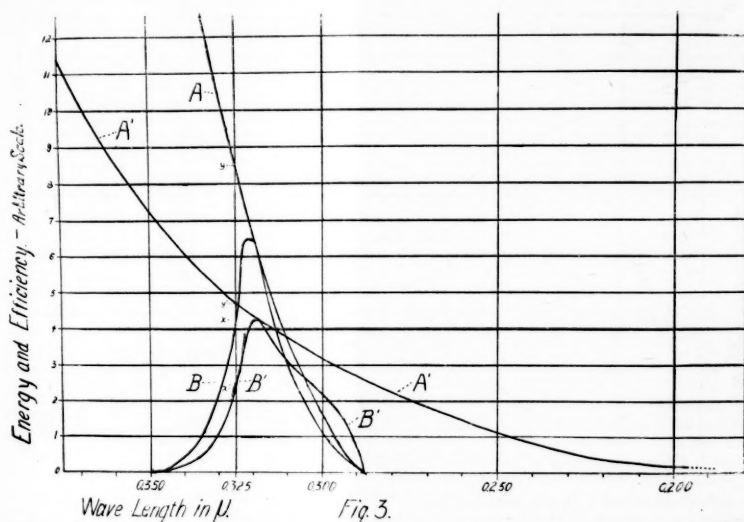


Fig. 3.

a tungsten lamp. These facts should be particularly useful to the clinician who has been about persuaded to purchase any apparatus for ultraviolet treatments which uses an incandescent lamp as a source, for he might anticipate that he would obtain quicker results if he treated his patients by giving them a heavenly treatment through exposing them to the radiations from a blue sky.

I must hasten to state however that the conclusions drawn from these curves cannot be pressed too far because nothing has as yet been said about the candle power of the incandescent lamp used. Curve A is for an incandescent lamp having a total luminosity equal to that of the blue sky. If we had used an incandescent lamp of higher candlepower curve A and its associated curves, B and C, would have been lifted upward. Of course we could have used an incandescent lamp powerful

tion of the sources used in ultraviolet therapy, and I should also like data on the efficiency of radiations of the various spectral regions in producing each therapeutic effect. In the absence of this desired information and for purposes of illustration, I have drawn in figures 3 and 4 a set of hypothetical curves, making no attempt at either accuracy or precision, except that I have confined the curves within the limits of published data, regardless of whether the experimental results have been confirmed or not and without in any way subscribing to their accuracy.

In figure 3 curve A is the energy distribution of the ultraviolet end of the solar spectrum. As in the previous figures the wavelengths are measured along the horizontal axis and the amounts of energy in arbitrary units along the vertical. Curve B depicts the efficiency with which radiations of various wavelengths bring



about some physiologic effect, for instance, a certain type of pigmentation of the human skin. The curve shows a maximum effect at wavelength  $0.32\mu$  and for this wavelength the curve is drawn tangent to curve A on an assumption similar to that made with the luminosity curve, i. e. that radiations of this wavelength are used with 100 p. c. efficiency. The curve indicates that radiations having a wavelength of  $0.325\mu$  (O on the horizontal axis) are utilized with an efficiency of 50 p. c., since at this wavelength the height of curve B is equal to one-half that of curve A. In other words, the distance OX is equal to half the distance OY. All other points

Curves A and A' in figure 4 are replicas of the curves in figure 3, but the associated curves B and B' are for a physiologic effect which is produced only by radiations shorter than  $0.31\mu$ , but in this case wavelengths shorter than those contained in sunlight are also effective. B' shows an activity for wavelengths as short as  $0.22\mu$ . Comparison of the area under B with that under B' shows that for producing this physiologic effect the artificial source is much more efficient than sunlight.

Assuming that the clinician prescribes the radiation intelligently and for only those kinds of cases for which radiation is indicated, then

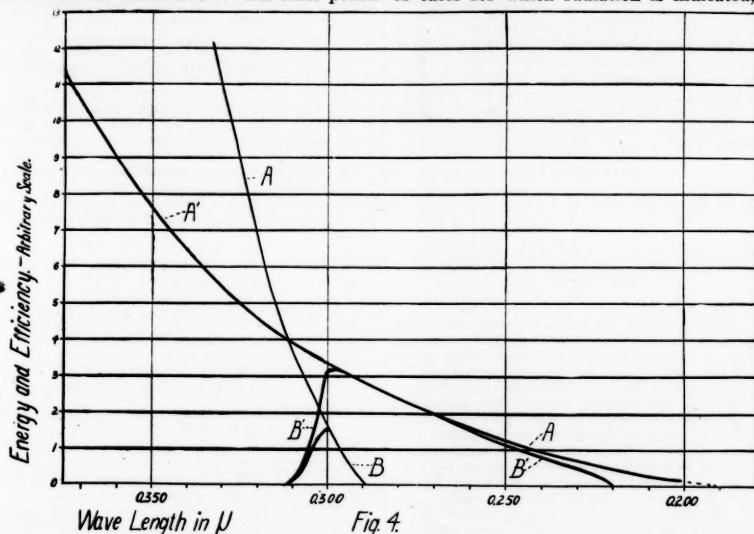


Fig. 4.

on curve B are to be given a similar interpretation, that is, B shows the efficiency with which radiations from the particular source, in this case the sun, are utilized in bringing about the physiologic effect.

Curve A' is the energy distribution of an artificial source and B' is the efficiency with which radiations from this particular source are utilized in bringing about the physiologic effect. Its absolute height is determined by drawing its maximum tangent to A', and the distance OX' is half the distance OY'.

The relative efficiency of the two sources is proportional to the areas under curves B and B'. These curves have been drawn on the assumption that this particular physiologic effect is not produced by wavelengths shorter than those found in sunlight, and the best therapeutic practice for producing this effect when this artificial source is used, is to use a filter which would cut out all the radiations shorter than  $0.29\mu$ , and thus prevent excessive surface burning.

the efficiency of the source will be determined, first, by the intensity and the amount of radiant energy emitted in the spectral region within which lies the activity curve for the physiologic effect, remembering that we must consider the amount as well as the intensity of the radiation, for it is obvious that one could not, for example, give a general radiation treatment with a source which emitted rays only through a small applicator; second, by the ease with which it can be used in the clinic, with regard to the comfort of the patient and convenience of the clinician; and third, by the original purchase price and the cost of repairs and replacements, which cannot be omitted in considering the ratio between output and input.

There is no doubt that ultraviolet irradiation is of definite therapeutic value in many pathologic conditions, but the limits of the effective spectral regions have never been determined and until they have been charted there is nothing for it but clinical empiricism.

In the following table which has been calculated from data given by Coblentz<sup>1</sup>, the spectral energies of a number of sources are given in percentage equivalents of the energy of sunlight at sea level in Washington, D. C., on May 25, 1926, between the hours of 11 and 12 a. m.

Amperes	Spectral component in percent of sunlight	
	$\lambda = 370$ to $310\mu$	$\lambda = 310$ to $180\mu$
Sun, sea level (Washington, D. C.)	100.	100.
Sun, 7000 ft. elevation (Flagstaff, Arizona).....	144.5	144.
Quartz mercury arc.....	4.	2.9
Gas filled tungsten lamp.....	12.7	1.0
Neutral core carbon arc.....	5.0	0.13
Neutral core carbon arc.....	26.0	16.2
White flame.....	10.0	4.9
White flame.....	90.0	92.0
Yellow flame.....	30.0	24.0
Red flame.....	30.0	29.0

## REFERENCE

<sup>1</sup> Bur. of Standards Scientific Paper No. 539: Coblentz, W. W., Dorcas, M. J., and Hughes, C. W., 1926.

## ULTRA-VIOLET TRANSMISSION THROUGH GLASSES

Editor, Boston Medical and Surgical Journal:

At a meeting today of the Committee on Public Health of The Massachusetts Medical Society, it was voted that in connection with the undertaking of the Committee to assist the Fellows of the Society in making an appraisal of the therapeutic value of ultra-violet radiation, the JOURNAL be requested to publish in full the enclosed report of the Bureau of Standards, together with an introduction, indicating that it is done at the recommendation and with the approval of the Committee.

It is the Committee's opinion that this report should be published subsequent to Dr. Bovie's article.

Very truly yours,

VICTOR SAFFORD, Chairman.

## ULTRA-VIOLET THERAPY

The following results of investigations by the U. S. Bureau of Standards are published at the request of the Committee on Public Health of the Massachusetts Medical Society. For the past year, the Committee has been directing studies with the object of assisting the Fellows of the Society in an appraisal of the therapeutic value of ultra-violet radiations.

Department of Commerce  
Bureau of Standards  
Washington

Letter Circular 235 (Third Revision)  
January 14, 1928

*The Ultra-Violet Transmission of Various New Glasses and Window Glass Substitutes as Compared with That of Common Window Glass*

This letter circular is issued in response to numerous inquiries for information on the transmissive properties of new glasses and organic substitutes for window glass for use in solariums, sun parlors, greenhouses, homes, office buildings, animal houses, and greenhouses.

The visible rays of light are comprised between

the approximate wave lengths of 760  $m\mu$  in the red and 400  $m\mu$  in the violet. Wave lengths longer than 760  $m\mu$  are called infra-red, and those shorter than 400  $m\mu$ , ultra-violet. Though the average eye is not sensitive to wave lengths shorter than 400  $m\mu$  such rays actually exist in the light of the sun, extending down to a wave length a little more or a little less than 300  $m\mu$ , depending on the time of day, season of year, latitude, altitude and clearness of atmosphere.

Since ordinary window glass shuts out the ultra-violet rays below about 310  $m\mu$ , much attention has been given of late to the production of special glasses, transparent to the shortest wave lengths which the atmosphere permits the sun to furnish us. This letter circular gives the results of ultra-violet transmission tests which have been made at the Bureau of Standards upon a number of such special glasses and common window glass.

TOTAL TRANSMISSION OF VARIOUS GLASSES FOR THOSE ULTRA-VIOLET SOLAR RAYS TO WHICH COMMON WINDOW GLASS IS OPAQUE

Using a filter method, direct measurements with sunlight as source, have been made during the noon hours of especially clear days from April to December, 1927.

These measurements covered the solar spectral region to which common window glass is opaque (below about 310  $m\mu$ ). Table 1 gives for that region the total transmission found for the following specimens:

TABLE 1

TOTAL TRANSMISSIONS OF VARIOUS GLASSES, WHEN NEW, FOR THE ULTRA-VIOLET SOLAR RAYS TO WHICH COMMON WINDOW GLASS IS OPAQUE

Trade Name	Per Cent. Transmission
Fused quartz .....	92
Correx .....	92
Helioglass (Vioray*) .....	50
Vita glass .....	50
Cel-o-glass† .....	20
Quartz-lite .....	5
Flexoglass‡ .....	1
Common Window Glass.....	0 to 5

\*Vioray is the foreign trade name for Helioglass.

†This consists of a fine wire screen whose interstices are covered with cellulose acetate.

‡This is a loosely woven fabric usually covered with paraffin.

SPECTRAL TRANSMISSION OF VARIOUS GLASSES FOR THE ULTRA-VIOLET RAYS

A second and more reliable method of measuring the relative transparency of a specimen of glass to ultra-violet light is to determine its spectral transmission curve, wave length by wave length. Curves of this description are shown in the accompanying illustration. These curves were obtained by means of an artificial source of light (quartz mercury arc) giving a line spectrum richer in ultra-violet than the solar spectrum.

By means of these spectral transmission curves an estimate of the relative transmissions of the various specimens for rays shut out by common window glass may be obtained by reading from the curves the values of the transmission at 302  $m\mu$ —the wave length of an intense mercury line, of convenient value for making such tests. Table 2 gives transmission values for this wave length. These are our most recent findings for new specimens.

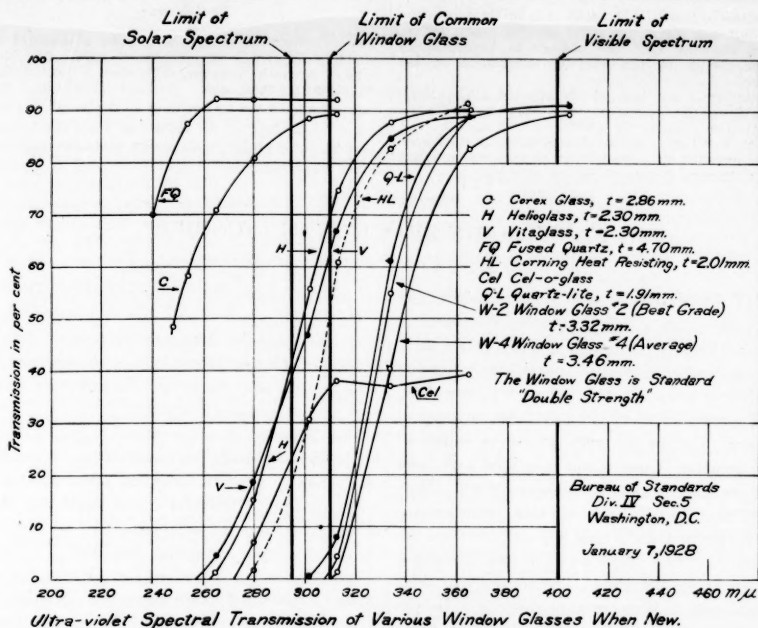


TABLE 2  
PER CENT. TRANSMISSION OF VARIOUS GLASSES AT  
302  $m\mu$  WHEN NEW

Trade Name	Number of Samples Tested	Average Thickness	Average Per Cent. Transmission at 302 $m\mu$
Fused quartz.....	1	4.7 mm	92
Corex .....	4	2.8	89
Helioglass .....	15	2.3	56
Vitraglass .....	15	2.5	44
Cel-o-glass .....	5	.1 (about)	30
Quartz-lite .....	16	1.9	0.5
Common Window Glass .....	14	3.3	0.0

#### SOLARIZATION

Helioglass, Vitraglass and Cel-o-glass have been found to decrease in transmission at 302  $m\mu$  and neighboring wave lengths (295 to 310  $m\mu$ ) by exposure to ultra-violet radiation from the sun, quartz mercury arc, and carbon arc. The rate of change is much more rapid with the arc than with the sun and varies also with the different glasses.

Vitraglass has been on the market the longest, hence concerning this glass we are able to give the most information on solarization. A sample which had been in a hospital window in Rhode Island for a year was found to have a transmission of 25 per cent. at 302  $m\mu$  (for thickness = 2.3 mm). Further exposure to the quartz mercury arc reduced the transmission but little, showing that solarization was complete.

Exposure in Washington of a sample ( $t = 2.35$  mm)

of Vitraglass directly to the sun for 123 hours (between 9 A. M. and 3 P. M. during June, July, and August) decreased the transmission from 47 to 35 per cent. Our tests show that the greatest decrease in transmission occurs during the first few weeks' exposure. The average transmission of Vitraglass at 302  $m\mu$  after complete degeneration by the mercury arc is about 25 per cent. for a thickness of 2.3 mm.

Helioglass has not been on the market for a sufficient length of time to obtain a complete solarization test. Two samples each of Helioglass and Vitraglass, exposed simultaneously to the sun in October to December, were found to have decreased in transmission at about the same rate. The average transmission of Helioglass at 302  $m\mu$ , after complete degeneration by the mercury arc is about 30 per cent. for a thickness of 2.3 mm.

Corex glass appears to undergo no appreciable change in transmission when exposed to solar radiation. For example, a sample of cathedral finish Corex which had been in a greenhouse roof in New York for 14 months was found to have, as nearly as could be measured on that kind of surface, the same transmission as a new sample. It was then polished plane and found to have a transmission of 89.5 per cent. at 302  $m\mu$ , while the average transmission for new samples as given in Table 2 is 89.

On the other hand, exposure to a quartz mercury arc causes a very marked decrease in the transmission.

Cel-o-glass (cellulose acetate) becomes opaque at 302  $m\mu$ , and shorter wave lengths, after 25 hours' exposure to the quartz mercury arc. A sample that was exposed to the sun for 400 hours during the months of April to October decreased but little in transparency at 302  $m\mu$ . On the other hand, samples that transmitted 30 per cent. at 302  $m\mu$  when new, transmitted only 5 to 10 per cent. at this wave length

after being exposed on the side of a building continuously day and night for eight months, April to December, showing that the change in transparency may be owing to the varying conditions of the weather.

Quartz-glass is not appreciably affected by sunlight. Exposure to the quartz mercury arc decreases its transmission slightly (measured at 313 m $\mu$ ).

Common Window Glass is also slightly decreased in transmission by exposure to the quartz mercury arc but changes inappreciably in sunlight.

#### THICKNESS

The thinner the glass, the greater in general will be its transparency to ultra-violet rays. Considerations of strength, however, set a limit to an indefinite reduction in thickness. Commercial samples have been submitted for test with a thickness of less than 1 mm (1/25 inch). In installing such glass, attention should be given to the proper size of sash to meet safety requirements.

## THE WASSERMANN REACTION IN JAUNDICE\*

BY DAVID DAVIS, M.D., AND NATHAN SIDEL, M.D.

MANY physicians believe that jaundice, per se, may cause a falsely positive Wassermann reaction. Thus a positive test is not infrequently ignored when jaundice, particularly intense jaundice, is present. As far as we have been able to determine there is no evidence to support this view. On the contrary whenever causes of falsely positive Wassermann reactions have been listed, jaundice is usually not mentioned<sup>1</sup>. Hornor<sup>2</sup>, Walker and Haller<sup>3</sup> note that jaundice was not a factor in their series.

In the past two years we have seen a number of patients with jaundice. The majority of these had a negative Wassermann reaction. In the small group of cases with positive serology there were two patients who presented the clinical picture of so-called acute catarrhal jaundice. One of these patients, a boy of 15 years, was shown to have been an untreated congenital luetic. The second, a girl of 19 years, continued to show repeatedly positive Wassermann reactions long after the jaundice had disappeared. These cases made us doubt the oft-heard statement that jaundice may be responsible for a positive Wassermann report.

The records of one hundred and two unselected patients showing varying degrees of jaundice were examined. Of this number, eighty-two showed a negative Wassermann reaction, twenty showed a positive Wassermann reaction. In the positive group, nine showed definite evidence of syphilis; arsphenamine poisoning was the cause of the jaundice in five of these nine. In eight of the remaining eleven showing positive serology, there were either suggestive histories or suspicious physical signs of syphilis. Thus, of the main positive group numbering twenty, only three were negative according to the records as to history and physical signs of syphilis. These three showed the clinical

picture of so-called acute catarrhal jaundice.

Of the one hundred and two records reviewed, fifty-nine had the diagnosis of acute catarrhal jaundice. In this group, eleven showed positive serology but only three were negative as to history and stigmata of syphilis.

The diagnosis of acute catarrhal jaundice cannot always be made with certainty. According to French<sup>4</sup>, "syphilis is apt to cause catarrh of many different glandular ducts, including those of the liver, and the symptoms will be very like those of simple catarrhal jaundice." Recent opinion favors an infectious hepatitis as the condition in so-called acute catarrhal jaundice. Is it not possible that the correct diagnosis in several of our cases was syphilitic hepatitis rather than acute catarrhal jaundice? May we venture the suggestion that syphilitic hepatitis be given strong consideration when a positive Wassermann is present with so-called acute catarrhal jaundice?

#### SUMMARY

One hundred and two records of unselected patients showing jaundice were reviewed to determine the influence of jaundice on the Wassermann reaction.

In this series, twenty showed a positive Wassermann reaction.

In this positive group, seventeen showed definite or probable syphilis by history or physical signs. Only three of the positive group were negative as to history and physical signs of syphilis.

Jaundice, per se, does not cause a falsely positive Wassermann reaction.

It is suggested that syphilitic hepatitis should be strongly considered when there is positive serology in so-called acute catarrhal jaundice.

#### REFERENCES

- 1 Noguchi, H.: Serum Diagnosis of Syphilis, Second Edition.
- 2 Hornor, A. A.: The Occurrence of the Wassermann Reaction among Hospital Patients. Boston M. & S. J., Vol. 174:194, Feb. 10, 1916.
- 3 Walker, I. C. and Haller, D. A.: Routine Wassermann Reactions of Four Thousand Hospital Patients. J. A. M. A., Vol. 66:488, Feb. 12, 1916.
- 4 French, Herbert: Index of Differential Diagnosis, Third Edition, page 314.

\*From the First Medical Service of the Boston City Hospital.



## PRESENT RESOURCES FOR HANDLING TUBERCULOSIS IN MASSACHUSETTS\*

BY GEORGE H. BIGELOW, M.D.

IT is valuable from time to time to review resources for control of a given disease and ask ourselves how adequate and effective they are. This is particularly true in tuberculosis where relatively so much is known, and where our work should be so effective. We have prided ourselves that as a state we met the standard of one bed for every annual death. We have diagnostic clinics, lots of them, on paper. We have many public health nurses to do case finding, and for the last three years under the able direction of Dr. Chadwick the Department has been holding clinics in the schools throughout the state as a sort of super case finding. Now your executive committee has been kind enough to invite us to review the whole matter and outline the state's policy as regards tuberculosis. We are delighted as it has made us think and has taken our mind off rabies.

First, are there enough hospital beds for the tuberculous? Under the statute hospitalization of adult pulmonary tuberculosis is the responsibility of the county or municipality for its residents and of the state for that unfortunate legal group known as the unsettled case. They are well named. On the basis of one bed for every annual death recent figures show a shortage of 665 county and 410 city beds, or a total of 1075 beds. This varies in the counties from a shortage of 243 beds in Middlesex and 125 in Worcester to an excess of 13 beds in Plymouth; and in the cities from a shortage of 237 beds in Boston to an excess of 20 beds in New Bedford.

But you remember that back in 1924 there was special legislation allowing counties to contract for hospital service with one another or with the state. At that time the Department stated that there appeared to be an adequate number of beds for pulmonary tuberculosis. What has happened if now we need a thousand? Isn't it a little harsh on the counties of Middlesex and Worcester, who have been more or less comfortably served under contract at Rutland to hold them up as the two counties with the greatest shortage?

Since 1924 the State Sanatoria at North Reading and Lakeville have been turned over to children and non-pulmonary tuberculosis, respectively, thus withdrawing some 500 beds previously available for pulmonary cases. Again during the last few years we have found increasing demands for our beds at Rutland which were not filled under a county contract. This waiting list has become very pressing and represents around 300 cases refused during the

past year. This pressure may in part be explained by the interesting finding of Dr. Remick that while five years ago thirty-five per cent. of all the known tuberculous demanded hospitalization now over fifty per cent. make such demands. This would account for increased pressure even with a decreased total number of cases. Again the unsettled or state case is coming more and more to the fore. One of the medical, social and economic tragedies of the day is that with empty beds for the tuberculous at that admirable institution, the State Infirmary, there are probably hundreds of tuberculous cases without settlement at large in the community. (I wonder how many of you here have spoken slightly of the service at Tewksbury without ever having visited it, or at least since Ben Butler's day.) But to say it is a tragedy does not stop these cases spreading the disease, and something must be done to hospitalize them. For these reasons the Department has decided that the State Sanatorium at Rutland cannot meet its other obligations and continue to give contract service to the counties of Middlesex and Worcester and that they must begin to look elsewhere for hospitalization of their tuberculous. This change will go a long way toward meeting the thousand bed need. Also Boston which has been squarely facing its tuberculosis problem promises to further decrease the deficit.

Now as to charges for this service. By putting the responsibility for caring for adult pulmonary tuberculosis on counties and cities, the legislature put the cost of this service on these political units. You are all familiar with how the charges for your cases are made by the city or county institution that serves you. But what about the state? By statute, children, that is persons under twenty-one, are cared for at seven dollars a week. This includes practically all the cases at the Westfield and North Reading Sanatoria and about half those at Lakeville. There are those who would increase this. The Department feared that towns would refuse to send their children if they were charged the entire cost, though a figure somewhat higher than seven dollars might be asked without an appreciable inhibiting effect.

Private patients, that is patients not paid for by the town in which they have a settlement, are charged seven dollars also. As in our cancer studies we find in tuberculosis a considerable group of persons who neither want nor should get charity, nor can pay for long term service the full cost, usually twenty-one dollars or more a week. These can pay from six to twelve dollars a week. There is practically no service

\*Read at the Meeting of the Massachusetts Association of Boards of Health, January 26, 1928.

at this rate available outside our state institutions, and this rate, perhaps raised a little, should remain. Of course it does make for the anomalous situation that if a given patient pays for himself the rate is seven dollars, whereas if the town pays it is more than twice as much. This is said to be a temptation to knavery for town officials. But knavery needs no temptation and will eventually receive its reward.

Then for the adult cases at Lakeville and Rutland the law says that the Department shall charge not less than cost. By taking an average per weekly cost for the last two (?) years at these two institutions the charge has been \$16.10, and compared with county, city and private institutions this is an excellent figure. A recent review of costs shows that this must be raised to \$17.50, which is what Middlesex and Worcester have been paying under the contract.

To repeat then, cases under twenty-one, and those paying their own way are charged seven dollars a week at the state sanatoria, while adults for whom the town pays will be taken for \$17.50.

#### REPORT ON TUBERCULOSIS DISPENSARIES

##### GENERAL COMMENT

GENERALLY, the adult visits to the municipal tuberculosis dispensaries are falling off. The child attendance, however, is increasing. There is discouragement among the nurses who try hard to get the adult to come for examination and advice; the patients, however, actually have to be dragged in.

As a case finding and consultation centre, with the exception of Framingham where an excellent outside physician is in attendance, Gardner where there is an exceptional social worker, and New Bedford, Haverhill, Brockton, Brookline, Boston, these dispensaries fail hopelessly. The local physicians do not use them at all or to a very limited extent. They either have no faith in the diagnostic ability of the dispensary physician or do not trust their patients to a local doctor.

With regard to the cities of 50,000 population or over, we feel that a minimum standard must be established so that the medical work will be uniform and of a high grade, especially the work of the contact and underweight children. There is no uniformity now, and the examination is only casually and inadequately made. In none of these dispensaries so far has the standard set up by our Ten-Year Program been adopted, especially the routine tuberculin testing and X-ray examinations. It is not necessary to report that without these aids, work on the contact child is not complete, to say the least. New Bedford, Lynn, Brockton, Brookline, Quincy and Boston do use the tuberculin test according to the judgment of the examiner. If our demonstration with the school

children is to be of permanent value it is necessary that these dispensaries and our clinics have a uniform point of view and methods. The courses at Westfield, and possibly later at North Reading, are, of course, in the right direction and should be extended.

May we suggest in outlining the scope of such work: first, study of the whole family when a case is reported; second, tuberculin testing of all contact children; third, X-ray of all contact children; fourth, follow-up of all contact children; fifth, follow-up of all contacts periodically, regardless of negative tuberculin test or weight; sixth, examination of underweight children for control and possible tuberculosis. There is a tendency on the part of nurses and social workers at present to stress underweight to the detriment of the contact child, which is fallacious.

Not all boards of health feel that it is necessary to make at least an initial visit to a case that is reported, especially if the local physician requests that such visiting be not done. Brookline is an exception in this regard in that the Board of Health insists that a patient once reported be visited at least once by the board of health nurse.

##### TUBERCULOSIS DISPENSARIES IN CITIES OF 50,000 POPULATION OR OVER

Quincy, Brockton, New Bedford, Malden, Boston, Lawrence, Worcester, Lowell, Fall River, Holyoke, Cambridge, Lynn, Springfield, Somerville and Newton.

These cities of 50,000 population and over are required by statute to maintain a tuberculosis dispensary. These, except Worcester, Lowell, Somerville and Newton, conform to the minimum requirements of the State Department of Public Health adopted March 1915, and amended July 1916 and November 1919. They need further revision.

*Lowell*—does not have a separate examining room. The Agent's room is used for this purpose.

*Cambridge*—would suggest a sign to indicate their dispensary building.

*Worcester*—the location is remote from the centre of the city, and the nurses have to use their auto in order to bring patients there.

*Somerville*—This city grossly neglects the dispensary law. Upon asking for the days and hours of their clinic we were given the information that a daily clinic was held at 11 A. M. at the Contagious Hospital on Broadway, Somerville. We found the place with difficulty, and found neither nurse nor doctor there at 11 or at 11:30. The matron at the hospital said that occasionally a patient is examined there. The hospital is situated far from the centre of the city. We are satisfied that Somerville is neglecting the dispensary part of their tuberculosis control. Their field work, however, is good.

*Newton*—This city held a dispensary at the Newton Hospital, but found that it was not at all patronized and, therefore, it fell into disuse some years back.

TUBERCULOSIS DISPENSARIES IN CITIES UNDER  
50,000 POPULATION

Brookline, Beverly, Newburyport, Revere, Winchester, Clinton, Leominster, Chicopee, Greenfield, Wakefield, Haverhill, Gardner, Adams, Gloucester, North Adams, Webster, Westfield, Peabody, Framingham, Taunton, Salem, Marlboro, Everett, Attleboro, Medford, Fitchburg, Methuen, Pittsfield, Southbridge, Arlington, Milford, Plymouth, Woburn, Northampton, Chelsea, Winthrop, Weymouth, Melrose, Watertown and Waltham.

These cities and towns under 50,000 population are maintaining dispensaries, though no longer required by statute, and they have had no formal request from the Department of Health to continue. These, with the exception of Fitchburg, Waltham and Marlboro, meet the minimum requirements for tuberculosis dispensaries as defined by the Department of Public Health on March 9, 1915, as amended July 1916 and November 1919.

*Marlboro*—the location is on the third floor in a building without an elevator—It should be on the first floor, if possible.

*Fitchburg*—the location is too far from the center of the city.

*Waltham*—the location is not satisfactory in that it is held in the office of the dispensary physician.

It would seem that the cities and towns in this group had better continue their dispensaries with the following exceptions:

*Southbridge*—not functioning. Is near enough to the Rutland State Sanatorium to utilize the clinic held there.

*Webster*—not functioning. Is near enough to the Rutland State Sanatorium to utilize the clinic held there.

*Plymouth*—town is really too small. It is near enough to the Plymouth County Hospital at South Hanson to take advantage of the county clinic there.

*Winthrop*—the tuberculosis problem is small, and the dispensary is not functioning. Service in Boston.

*Weymouth*—not functioning. Can be taken care of by the Norfolk County Hospital.

*Melrose*—not functioning; too near Boston.

*Watertown*—not functioning but largely because of industries has problem. *Waltham*—not functioning, and hardly worth reviving. (From No. Reading.)

*Woburn*—not functioning, may be difficult to revive.

*Westfield*—is functioning poorly. It is too near the Westfield State Sanatorium where a daily clinic is held.

It is interesting to note that Revere has a case to death rate, for 1926, highest in the State, of 8.2 to 1, with Arlington, Clinton and Adams a case rate of 5 to 1. Reporting is apparently very poor in Northampton, Holyoke and Gloucester where more deaths than cases are on record.

Further striking evidence is contained in the following letter:

Westfield State Sanatorium,  
Westfield, Mass.,  
January 24, 1928

Dr. George H. Bigelow, Commissioner,  
Department of Public Health,  
State House, Boston, Mass.

Dear Dr. Bigelow:

RE: NOTES IN REGARD TO THE SCHOOL CLINIC FOLLOW-UP  
A summary of thirty-four cities and towns examined this year by Dr. Martin shows these figures:

Number listed for re-examination...	1332
Number examined.....	929—69%
“ refused .....	177—13%
“ moved away or absent from school.....	226
“ improved .....	475—52% of 929
“ unimproved .....	454—48% “ “
“ recommended for sanatorium care.....	94—10%

The most striking deduction from these figures is that only about one-half of the children examined had made any improvement in one year's time.

Ninety-four or 10% of those examined were recommended for sanatorium care. These children had lost ground or had remained in very poor physical condition throughout the year. There are about fifty vacancies for boys at Westfield at the present time. It is apparent that insufficient effort is made to get these sick children under sanatorium care.

It is evident that more intensive work has to be done by the Board of Health and School Nurses. The Health Nurses should keep close supervision over all the hilum and pulmonary cases. The School Nurses should give their attention to the suspects and malnutrition groups. The reasons the School Nurses have given for not following up these cases is that they have 2,000 or more children to look after and they are kept busy with the routine things to such an extent that they have little time left for the clinic cases and they are unable to do detailed work with these children. They are called upon for so many lines of health work that their time is spread too thin to get good results in many things that they attempt to do. Our clinic cases appear to be a secondary consideration in many places.

We give them a list of children who are in the greatest need of special care and it seems to us that they should concentrate their work upon this group. They should attempt in the first place to get the defects remedied and arouse the interest of the parents in carrying out the advice given in regard to rest and diet. This requires time to make home visits, patience and persistence on the part of the nurse. The health class method as carried out by Dr. Cecconi should be widely adopted, as group instruction and supervision takes less of the nurse's time and gives better results.

The large number of refusals—177—indicates that the nurses have not gained the confidence of the parents, as otherwise they would permit the children to be examined. It is true that the family physician, in a few instances, advises against having the children go to the re-examination clinics.

The school nurses appear to be without adequate supervision and direction in many places. Pediculosis takes more of their time than tuberculosis. The Boards of Health comply with the law by filing our reports, but as childhood tuberculosis is not a disease requiring a placard, they appear to think there is nothing more to do about such cases until the diagnosis is confirmed by serious illness. There is no glory or obligation preventing disease. Therefore, some Boards of Health do not appear interested. What work is done, in such communities, is by volunteer agencies.

Dr. Zacks is getting some data for you from the nutritionist's report in the last year. I am sorry I cannot give you something more worth while.

Very truly yours,

HENRY D. CHADWICK, M.D., *Chief of Clinics,*  
Westfield State Sanatorium,  
Westfield, Mass.

THE address of Dr. O'Donnell, Director of the Division of Tuberculosis of the Boston Department of Health, which followed that of Dr. Bigelow, was of great interest both because of its substance and manner of presentation.

He explained the details of the work now underway in Boston which has resulted from the transfer of the Boston Sanatorium Department to the Health Department, and reported that in 1927 Boston had the lowest death rate due to tuberculosis in the history of the city. The city is now furnishing clinic services at all of the health units and in the municipal buildings in Brighton, Dorchester, Hyde Park, and Charlestown as well as at the south and outpatient department on East Concord Street.

He paid a tribute to the Boston Tuberculosis Association for the assistance which has been given in this work and outlined the plans for future work which assures the most modern and efficient handling of the tuberculosis problem.

#### HYDROGEN SULPHIDE OFFERS SERIOUS HAZARD IN PETROLEUM INDUSTRY

Warning against the danger of hydrogen sulphide poisoning in the production, handling, and refining of certain crude petroleum is again voiced by the United States Bureau of Mines, Department of Commerce. Hydrogen sulphide associated with the gases and vapors from certain crude oils now being produced in the United States has forced a serious health and safety problem upon the petroleum industry, the Bureau declares. Although the presence of hydrogen sulphide in or occurring with Mexican crudes has been known for some time, it was not until recently that crude oils which give off poisonous amounts of hydrogen sulphide have been produced to any extent in this country.

Great care will have to be exercised to cope with the hazards of poisoning, points out H. C. Fowler, petroleum engineer, in a report just made public. All men working in oil fields or at pump stations, gasoline plants, and refineries that handle high-sulphur crudes and the gases therefrom, should be

adequately warned regarding the poisonous nature of hydrogen sulphide. Suitable warning signs should be posted in conspicuous places about the plant and at tanks, pipe line and compressor stations, and wherever tests prove or indications show a dangerous condition exists or is likely to develop.

The injurious effects of this poisonous gas were first recognized by the refiners along the Atlantic and Gulf Coasts upon receiving shipments of crude petroleum from Mexico.

Hydrogen sulphide is a colorless gas heavier than air. In relatively low concentrations it has a "sickly sweetish" taste and a disagreeable characteristic odor which in some localities has led to the use of the term "rotten gas." It forms explosive mixtures with air.

When exposed to hydrogen sulphide, white lead paint, the principal constituent of which is basic lead carbonate, turns to a dark brown or almost black color, due to the formation of lead sulphide. Many houses and signs in oil field communities of the Texas Panhandle and southwestern Texas are witness to this fact. Copper, lead, and silver tarnish rapidly when exposed to hydrogen sulphide.

In the petroleum industry, hydrogen sulphide is recognized as a highly corrosive agent. Leaks due to pitting, and the sticking of valves and other fittings, causing frequent replacements of equipment at places where hydrogen sulphide is known to exist, give proof of its deleterious affinity for metals.

Hydrogen sulphide gas in high concentrations quickly deadens the sense of smell. For this reason its characteristic odor, as initially sensed in the lower concentrations, is not a definite warning of danger. In many cases a person would probably not have time to be warned by the odor before he becomes unconscious. The margin between consciousness and unconsciousness, and between unconsciousness and death is very narrow. Probably one breath of the gas may be sufficient to cause asphyxiation. Exposure to low concentrations may cause irritations of the eyes ("gas eyes") and irritations of the breathing passages and lungs.

Hydrogen sulphide, in high concentrations, however, acts so quickly when breathed that there is no time to call a doctor before beginning treatment. The first requisite is to get the victim to fresh air. Those rescuing the victim of gas must exercise every precaution or they too may be overcome. If the victim has stopped breathing, artificial respiration should be given immediately. A doctor should be summoned without delay; but not at the expense of stopping artificial respiration. If an inhaling apparatus is available, oxygen should be given in connection with the artificial respiration. Under no circumstances should artificial respiration be suspended until the man resumes breathing or it is definitely established that life is extinct.

Hydrogen sulphide has been found in injurious amounts throughout almost every step of handling and refining high-sulphur crudes from the casing head at the well until they reach the semi-final stage of finished products.



**Case Records  
of the  
Massachusetts General Hospital**

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN  
WEEKLY CLINICO-PATHOLOGICAL EXERCISES

EDITED BY R. C. CABOT, M.D.

F. M. PAINTER, A.B., ASSISTANT EDITOR

**CASE 13581**

**DROWSINESS AND NOSEBLEED**

**MEDICAL DEPARTMENT**

*First admission.* A Canadian rubber worker twenty-eight years old was sent from the Out-Patient Genito-Urinary Department August 31 for swelling and tenderness of the left testicle of three months' duration. The swelling increased for two months after its appearance, then decreased. At admission he still had a hard tumor, and a discharging sinus on the right testicle.

His past history was entirely negative so far as he could remember except for a running sore on the left testicle four years before admission.

The family history is not important.

Clinical examination showed enlarged axillary and inguinal lymph nodes varying in size from being just palpable to the size of a grape. In the right groin the glands below Poupart's were enlarged and slightly tender. The epididymis was much thickened, indurated, adherent to the skin and showed a small crater-like sinus with rather abrupt edges. The upper pole of the left testicle was thickened.

At operation a much thickened and in places caseous epididymis was removed. A pathological report of tuberculosis was made. The patient made a good convalescence and was discharged relieved September 11.

*History of interval.* He was given tuberculin in the Out-Patient Department for two years and a half. At the end of that time he was feeling perfectly well, with no symptoms. The wound was clean and solid. In September, three years later, examination in the Accident Room showed no masses. The left epididymis contained a few small hard nodules which were not increasing in size. The general condition was excellent—appetite good, weight increasing, no cough. Five years after this note he had a right nephrectomy in another hospital following a kick from a horse. There was "blood clot" in the kidney (?). (Tuberculous kidney?) He was out of work six months. After this he was free from symptoms for five years. Two years before admission he had nycturia three or four times for four months. The same year he had a "pimple" in the penis which started to spread and located on the foreskin. He treat-

ed it with a salve which made it break and spread. It did not clear up for eight months. A year before admission he felt tired and run down. He seemed to improve after a short time, but in about ten months again began to tire easily, especially when doing heavy work, although he could run without any ill effects. About a month before his readmission he began to be dyspneic on climbing one flight of stairs, and felt drowsy. He grew gradually worse. A physician put him on a diet without relief. For four days before readmission he vomited about once a day. He thought his urinary stream was not so strong as it had been. There were no other urinary symptoms. For four days he had been in bed for the first time. For two days before readmission he had been unable to bear his weight on his legs. The day before readmission he could not move his hands at all. The day of admission he could move them a little. He had a tingling feeling like pins and needles in his legs and feet. His feet were cold and numb. He felt drowsy. For seventy-two hours (?) he had not slept. The day before admission and the morning of admission he had nosebleed for a short time. His mouth was dry. He thought he had had no loss of weight during the present illness. His best weight was 160 pounds, when he was nineteen years old, his present weight 137.

No benzol was used in his department of the factory and he did not come into contact with it in other departments.

*Second admission.* August 27, fifteen years after his first admission.

Clinical examination showed a pale, poorly nourished man lying flat in bed in no apparent distress, with bleeding from both nostrils and dried blood upon his lips. The skin and mucous membranes were pale, with a questionable slightly icteric tint. The eyes showed subconjunctival hemorrhage about the outer circumference of the iris and across the sclera at two o'clock. On the under side of the tongue were two moist lesions, not indurated, one centimeter and half a centimeter in diameter. The few remaining teeth were decayed. There was bleeding about the roots of all the lower teeth. The apex impulse of the heart was not found. There was no enlargement to percussion. The sounds and action were normal. A blowing systolic murmur replaced the first sound at the apex and the base. The artery walls were normal. The blood pressure was 155/100. The abdomen showed voluntary spasm. In the left upper quadrant was a mass descending with respiration, feeling more like kidney or glands than spleen. There was resistance and dullness in the right upper quadrant, perhaps voluntary; no mass was felt. On the dorsum of the penis was a lesion 3 by 1.5 centimeters, indurated along the upper border, punched out, old in appearance, oozing serum from the center. The legs showed weakness but not paralysis. The

arms showed slight weakness. The pupils and fundi were normal, the knee-jerks diminished. There was no reaction on stroking the foot for Babinski. The touch sense was diminished. The other sensory reactions were normal.

The amount of urine is not recorded. A specimen in the Emergency Ward was loaded with pus. An overnight specimen showed 0 to 1 leucocyte per field, no red cells, a very slight trace of albumin, specific gravity 1.016. Blood: 5,800 leucocytes, 88 per cent. polynuclears, hemoglobin 25 per cent., reds 3,000,000, moderate achromia and variation in size and shape, rare polychromatophilia, reticulated cells 2 per cent., platelets increased. Wassermann negative.

Temperature 97° to 99°, rectal. Pulse and respirations normal.

The patient entered at four o'clock in the afternoon. He seemed semistuporose and was anxious to be put to sleep. Veronal was not effectual, codein was vomited and paraldehyde by rectum was expelled. At midnight 1/6 of a grain of morphia and 1/200 grain of scopolamin were given subcutaneously. At one o'clock in the morning there was complete paralysis of the legs, with absent reflexes and rapidly progressing paralysis of the arms. Respiratory paralysis soon set in. A lumbar puncture was negative. At three o'clock the patient died from steadily increasing respiratory paralysis.

#### DISCUSSION

BY RICHARD C. CABOT, M.D.

##### NOTES ON THE HISTORY

We had last Thursday here a case of tuberculosis meningitis following a blow in the back of the neck,\* and we discussed then the possibilities or probabilities of the blow having anything to do with it. I felt pretty clear that it did not in that case. In general I am skeptical as to definite causal relations between local trauma and internal disease. As to surgical tuberculosis, especially tuberculosis of the kidney in a person who has previously shown evidences of tuberculosis of the genito-urinary tract, I think I should be even more skeptical than usual about the effects of a kick of this kind.

All the symptoms seven years ago were on the right, and the trouble that he had had before was on the left.

##### NOTES ON THE PHYSICAL EXAMINATION

The platelets increase is especially important if true, because we are dealing with a condition where we expect the platelets to be decreased.

##### DIFFERENTIAL DIAGNOSIS

The background of the case so far as the previous history gives us any evidence is one of tu-

berculosis of the genito-urinary tract. I do not see that we have anything else that we are at all sure of. He has this lesion on the penis, the nature of which I do not know. I do not believe it is syphilis. Then after this long interval of fair health he comes in bleeding from the nose and mouth, with a moderate secondary anemia, with a rather high blood pressure, and with pus in one urine specimen and not in another.

He certainly has not anemia enough to die from, but he perfectly well might die if another hemorrhage such as he has had happened to hit the nervous system, perhaps in the region of the medulla or perhaps in the ventricles.

If we take the account of the lumbar fluid literally, as I suppose we must, we must say that he had no meningitis. Anybody who is semistuporose and has a previous history of tuberculosis lesions makes us think first of tuberculous meningitis. But I think that can be ruled out here.

A paralysis coming on as rapidly as this cannot possibly, that I see, be a cord paralysis in the absence of any demonstrable spinal lesion. Besides which his spinal fluid ought not to have been negative if he had something bulging into the cord from the vertebrae. I think we have to say that it is a brain lesion, and a brain lesion coming on more rapidly than any brain lesion that I know except cerebral hemorrhage.

That of course is only the terminal event. He had a secondary anemia and some bleeding before that. What the cause of that bleeding was I do not know. We have no study of the blood in relation to the different types of purpura. One cannot tell whether the platelets were decreased or not. It may be a thrombopenic purpura. That would go with cerebral hemorrhage as the terminal event. Tuberculosis seems to be one of the diseases which predisposes to thrombopenic purpura.

I do not see that we have any good reason to suspect nephritis, though since his blood pressure was a little high and his urinary gravity a little low, it goes through our minds as a possibility. I suppose the majority of cases of genito-urinary tuberculosis are bilateral. He has had considerable tuberculosis, we have reason to believe, in one kidney. He may have some in the other now. But without an examination of the urinary sediment and catheterization of the ureter I do not see how we can say more on that.

A PHYSICIAN: You would not think of some queer cerebral glioma?

DR. CABOT: Of course we know that we can have an entirely silent glioma which when it bleeds gives symptoms indistinguishable so far as I know from cerebral hemorrhage. I do not know that we can do anything more than think of it. He did not have an eyeground examination.

\*Case 13541, January 12, 1928.

A PHYSICIAN: He is forty-three years old, but I should think it might be thought of.

DR. CABOT: A thing that influenced me against glioma was the knowledge that he was bleeding from other points, so that it seemed quite possible that he might be bleeding in his brain. I do not think I can go any further on that. I think he has a focus of tuberculosis still in his genito-urinary tract. I think he has a purpuric type of bleeding, I suppose with low platelets, perhaps based on that tuberculosis. I think he has a cerebral hemorrhage. I do not mean to try to say where that cerebral hemorrhage is. My luck in predicting the localization of cerebral lesions has seldom been good.

A PHYSICIAN: What about that mass in the left upper quadrant?

DR. CABOT: We have to take the say-so of the man who felt it. He says it feels more like a kidney or glands than like a spleen. Glands are not very likely there, so far as I know. It seems to me more likely to be a kidney than anything else I can think of, and if a kidney, a presumably tuberculous kidney. If it is a spleen it could perfectly well be associated with the purpura. We get big spleens in purpura and we cannot tell whether it is a spleen or is not from the facts given us. If they had inflated the colon they could have decided, but he was probably too sick.

DR. CHESTER M. JONES: If it was purpura it would not be thrombopenic purpura. It is rather unusual not to get some red cells in the urine in that disease. He was bleeding from other places at the same time. We might call it an idiopathic type of purpura with fairly normal platelets.

DR. CABOT: I do not take much stock in an estimate of platelets in the smear, do you?

DR. JONES: No, except that if they are found in the smear they usually are not sufficiently reduced to cause purpura. A platelet count is a difficult procedure.

DR. CABOT: Yes. One has to have done a good many to have any success with them.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Acute ascending and respiratory paralysis.  
Medullary hemorrhage.

DR. RICHARD C. CABOT'S DIAGNOSIS

Cerebral hemorrhage.  
Genito-urinary tuberculosis, probably in the left kidney.  
Purpura hemorrhagica.

ANATOMIC DIAGNOSES

1. *Primary fatal lesions.*

Tuberculosis of the left kidney.  
Tuberculous ureteritis and cystitis.  
Miliary tuberculosis.

3. *Historical landmark.*

Nephrectomy.

DR. TRACY B. MALLORY: The case from beginning to end is one of tuberculosis. The brain on examination proved entirely negative, also the meninges. The lungs, liver, spleen showed miliary tubercles. The left kidney was considerably enlarged and was almost completely destroyed by caseous necrosis. The process had extended down the ureters. There were miliary tubercles the entire length of the ureters. There was tuberculous cystitis and prostatitis. The mass in the left upper quadrant may have been either spleen or kidney so far as we could determine. Both were enlarged, the spleen weighing nearly 300 grams, due to the miliary tuberculosis. The kidney was enlarged, probably both by the tuberculous process and as a compensatory hyperplasia for the absent kidney on the other side.

As to the respiratory paralysis I have only a suggestion to offer. On talking it over with the house officers afterwards it seemed to me that considerably more stress was laid on that than was perhaps justified. The duration of this symptom from its onset to death was only a little over an hour, in an extremely weak man who had just been given morphine. And when one comes down to it, all cases before they come to us do show respiratory paralysis.

DR. CABOT: Did you find anything more about the cause of that paralysis of the legs?

DR. MALLORY: No. It seems to me that could have been just extreme weakness. I do not think they had any very definite information.

DR. CABOT: Did he show any internal hemorrhages like those outside?

DR. MALLORY: No.

A PHYSICIAN: How about the low temperature?

DR. MALLORY: We get that in these terminal miliary tuberculosis cases not infrequently.

CASE 13582

HEMOPTYSIS OF UNKNOWN ETIOLOGY;  
ITS METHOD OF TREATMENT

MEDICAL DEPARTMENT

A married Russian Jewish clerk of forty-five entered the hospital on October 24 complaining of hemoptysis of two days' duration.

His mother had had occasional hemoptysis every two or three years for thirty-five years, sometimes large in amount. Her doctor said she did not have tuberculosis.

The patient's general health had always been good.

Ten years ago he coughed up a spittoonful of blood without any previous symptoms. He had a chest plate taken at this hospital. His own

doctor said he had tuberculosis and kept him in bed for two weeks. Following this he went back to work and was absolutely symptom free until one year ago. Then his business failed and he began to feel worried and a little tired, but had no definite symptoms until the past few months. Then he had dull pain in the right inguinal region not related to anything. He thought it due to heavy lifting. In the past few weeks he had been tired, going to bed after supper. He had slight dry unproductive cough with vague pain in the region of the right clavicle. Two nights before admission he spit out a mouthful of bright red sputum. The following morning he again spit up a mouthful of bright red liquid which he felt more sure he coughed up. He felt well. He went to a doctor, who advised an X-ray. The patient came to the Emergency Ward of this hospital, where he said he spat blood for the third time. The morning of admission he coughed up three or four good sized mouthfuls of bright red blood under observation. He had had no known fever, night sweats, or anorexia.

Clinical examination. Teeth worn, carious. Pyorrhea. Septum deviated to the left. Lungs examined only with quiet breathing. No rales heard. Abdomen, reflexes and heart negative. Blood pressure 135/85. No clubbed fingers.

Temperature, pulse and respiration normal.

Urine negative. Blood: 13,500 to 11,500 leukocytes, 64 per cent. polymorphonuclears, 28 per cent. lymphocytes, hemoglobin 80 to 85 per cent., reds 5,710,000 to 5,300,000, normal in size, shape and staining. Platelets normal in size and numbers. Wassermann negative. Sputum negative for tubercle bacilli at six examinations.

X-ray October 24. Examination of the chest was essentially negative. There was a deformity of the ninth rib posteriorly, probably due to old fracture. October 28 the findings were practically the same as at the time of the previous observation. The heart shadow seemed a little large to the left. The aortic arch was tortuous. No definite evidence of tuberculosis was seen.

The patient had slight hemoptysis the morning after admission to the ward. He was discharged November 2 with a diagnosis of hemoptysis of doubtful cause, probably pulmonary tuberculosis. Orders: Three weeks' more bed rest. Three months' house rest. Return to Out-Patient Department.

On reporting at the Out-Patient Department he was examined at the Pulmonary Clinic. His lungs were absolutely negative. There was nothing in his chest to account for the hemoptysis. He had been examined at the Nose and Throat Clinic. No evidence of ulceration or recent bleeding was found. The veins in the pharynx were dilated and congested and might account for the bleeding. Orders: Continue work.

## DISCUSSION

BY RANDALL CLIFFORD, M.D.

I do not think that we have sufficient evidence to account for the occasional attacks of hemoptysis which the patient's mother has had for the past thirty-five years except that it was probably not due to tuberculosis.

The fact that the patient raised a spittoonful of blood ten years ago and the doctor said that he had tuberculosis at that time is very significant and strongly suggests a probable tuberculous infection. On the other hand we note in the history that after two weeks in bed he was then allowed to go to work again, and has been working for the past ten years without any ill effect on his general condition, and has been entirely free from symptoms until a few weeks ago. Another very striking thing in regard to the history is the fact that he came into the Emergency Ward of his own accord. This means, I think, that the patient himself was very much alarmed over his hemorrhage. I know of nothing that is more alarming to both patient and doctor than a sudden hemorrhage like this out of a clear sky without any preliminary warning.

The physical examination is essentially negative. There is nothing in the blood picture or the heart which might explain his hemoptysis.

There is nothing more difficult to deal with than this type of case. Here is a man who ten years ago had a definite hemoptysis, who went back to work and was perfectly well until he entered the hospital with another hemorrhage, and whose physical examination, X-ray plate, and laboratory findings were all negative. The fact that he was perfectly well after his first hemoptysis makes one question very strongly whether the original hemoptysis ten years ago was due to tuberculosis, although we have the evidence of his doctor to that effect.

It is strange that the X-ray taken when he was in the hospital was absolutely negative. If he had tuberculosis ten years ago it would seem probable that we should have some legacy of his old infection, and that the plate taken when he came into the hospital would have shown some chronic fibrosis or evidence that he had had tuberculosis in the past. If tuberculosis had been the cause of his original hemoptysis we would suspect that in the interval of ten years we would have some evident manifestation either by physical examination or by X-ray.

The probability of some upper respiratory condition such as a dilated vein in the pharynx, bleeding gums, or some nasal condition, should all be taken into consideration as possible factors. The examination at the Nose and Throat Clinic gives us very little help, and the fact that his temperature has been normal while in the ward would tend to exclude any upper respiratory infection or active process.



I do not think that we can make a definite diagnosis in this case. All that we can say, I think, is that it is a case of hemoptysis of unknown origin.

The problem of treatment in this case is a very important one it seems to me. Should this man, on the basis of his hemoptysis alone, without any other evidence, be considered tuberculous and treated as such, or should tuberculosis be suspected and he be allowed to carry on his normal routine in life but be kept under very careful observation? I remember seeing this man in the Pulmonary Clinic, and the problem in my mind at that time was whether we should deprive him of three months' work when our only evidence was hemoptysis. I felt that he should be given a trial and allowed to do light work under supervision, on the basis that we did not have sufficient evidence to make a definite diagnosis of tuberculosis. On the other hand, I think we have to say that without evidence of any other factor to account for his hemoptysis tuberculosis must be strongly suspected; but the fact that he went ten years without any symptoms, and with a negative X-ray, I think makes the probability of tuberculosis very indefinite.

There is nothing more important than to reassure the patient and to explain carefully that his hemoptysis is not going to be fatal, for this is rare except in cases of advanced tuberculosis. I should like to know, Dr. Cabot, how you feel about this case?

DR. CABOT: I think you are quite right about sending him to work. That is the crucial point. One does not want to be reproached in case anything goes wrong, and so one hesitates to give the patient the benefit of the doubt by urging him to work. I think in this case, where we have such a well-documented case against tuberculosis, it is our duty to take the slight chance of our being wrong and the considerable chance of being reproached.

DR. CLIFFORD: What was given for the hemoptysis while he was in the hospital? The reason I ask is that about three weeks ago I was called to see a case of acute hemorrhage in a girl of about eighteen. This girl had had evidence in the past of a lesion at the right apex, and the only findings were a few râles on auscultation. She was acutely ill and her doctor said that he had given morphia to control her cough. She developed an acute tuberculous

pneumonia, and I am anxious to ask Dr. Cabot whether he feels that morphia is contraindicated in cases of acute hemorrhage? If possible, I feel that it is better to get along with some drug other than morphia in view of the danger of a hypostatic pneumonia developing.

MISS PAINTER: I do not know what he was given in the Emergency Ward. The orders in the house were tuberculosis precautions and half a grain of codeia every three hours by mouth for cough.

DR. CABOT: I have had very poor success in stopping pulmonary hemorrhage with morphia. I think if it is not going to do the thing you give it for and may do something you do not want, we have first-rate reasons for not giving it. If there is any chance of putting a new burden on your patient by giving a drug which you are not sure is going to do any good, it is best not to give it.

DR. TRACY B. MALLORY: Do you pay any attention in these cases to posture? I happen to remember two cases of hemorrhage during the past year, one of abscess and one of bronchiectatic cavity, where the patients apparently drowned in their own blood. They had been heavily morphinized, kept in an upright position, and were unable to or did not cough out the blood in sufficient quantities. The bronchial tree from the trachea down in each case was a solid mass of coagulated blood.

DR. CLIFFORD: I do not know why we do not try postural drainage more in cases of acute hemorrhage from the lungs. I can see no contraindication to its use, and it would, I think, greatly lessen the danger of the lungs' filling up with blood and would diminish the possibility of pneumonia. It is interesting that both the cases that Dr. Mallory speaks of were heavily morphinized, and the fact that both of these cases drowned in their own blood is I think good evidence against the use of morphia in most cases.

DR. CABOT: What is your recent experience with the ancient problem of hemorrhage from little veins in the throat? I have lived through various periods myself of belief in that and disbelief in it, of people saying, "You say that because you have to say something" and others saying, "Why shouldn't you have it?"

DR. CLIFFORD: I think that is true. This is a typical case. The veins in the pharynx were dilated and congested, but this was not sufficient to explain the hemoptysis. I saw a case of hemoptysis last year about which the nose and throat consultants said there was no question but it was due to the rupture of a small vein in the throat. The throat was treated, and there has been no recurrence since that time.

#### DIAGNOSIS

Hemoptysis of unknown etiology.



## THE BOSTON Medical and Surgical Journal

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J. A. WARK, M.D.SUBSCRIPTION TERMS: \$6.00 per year in advance, postage paid  
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### SOME STATISTICS ON PULMONARY TUBERCULOSIS

We know that the word "statistics," to any one not mathematically minded, has a dry sound, and we doubt if many of our readers, excepting those who have some interest in public health matters, ever give much of their time to the reading of reports of vital statistics, unless they are served to them well garnished with a piquant human interest dressing. We grant that many tables of figures of cases or deaths from this or that disease are often dull fare, but every now and then we discover in the bulletins of health departments or of insurance companies or the various public health services something of more than passing interest, and sometimes we find something that is nothing short of amazing. Here is an example that aroused our attention and set us to pondering. In the "Monthly Bulletins" of the Health Department of the City of Boston there is a table headed "Time elapsing between Date of Reporting Cases of Pulmonary Tuberculosis and Date of Death." In the November report we are told

that nearly 12 per cent. of the cases were reported *after death*! Another 12 per cent. were reported as having tuberculosis one week before death, and of all the deaths reported in that month one half of the cases had been reported within a month of death as having tuberculosis. These startling figures if taken as they stand might indicate that pulmonary tuberculosis is one of the acute infectious diseases, which of course it rarely is.

There is only one conclusion to be drawn from these figures and that is there is a serious delay in reporting cases of this disease. We know that many persons are reluctant to have the names of any members of their families placed on public record as having tuberculosis—they still feel that there is a stigma attached to this disease. We know of the pressure sometimes brought to bear on the physician either to withhold his report or to substitute some less dreaded name. We realize, too, that the busy practitioner sometimes, perhaps frequently, fails to report such cases when first diagnosed. This all sets us to wondering what is the percentage of all cases of pulmonary tuberculosis actually reported.

This, after all, is not a question of merely having tidy reports so that the conscientious vital statistician may have his various pigeon holes in order. It is a question of far greater moment. Such statistics form the basis of the activities directed to the control and final eradication of this common disease. If one half of those persons dying of pulmonary tuberculosis neither consulted a physician nor had their condition diagnosed until within a month of their death, then there arises an urgent need for renewed efforts toward informing the public of the symptoms of the disease and the necessity of seeking immediate medical advice. If there is a delay in diagnosis, then our efforts should be directed towards extending knowledge of the means for making an early diagnosis. If the fault is due to a delay in reporting, then the physician is neglecting both his professional and public duty.

The situation as disclosed in these reports is worthy of serious consideration. For the sake of the consumptive, both present and future, for the sake of the epidemiologist, and for the sake of those engaged in the war against this disease, every case of pulmonary tuberculosis should be reported when diagnosed.

### THE CENTENNIAL ANNIVERSARY EXERCISES COMMEMORATING THE FOUNDING OF THE BOSTON MEDICAL AND SURGICAL JOURNAL

Invitations have been issued to members of The Massachusetts Medical Society and guests to convene on the evening of Saturday, February eighteenth, and participate in the exercises commemorating the one hundred years of con-

tinuous publication of THE BOSTON MEDICAL AND SURGICAL JOURNAL. This record is unique in this country and approaches that of the *London Lancet* the only other Medical Journal in the world with a longer continuous existence so far as we have learned. Dr. John M. Birnie, President of the Society, will preside and introduce Dr. Homer Gage as Toastmaster.

Short addresses will be given by persons who have been connected with the JOURNAL in recent years and representatives of other State Societies.

Dr. Morris Fishbein, Editor of the *Journal of the American Medical Association*, will be the guest of the Society and deliver an address. He is recognized as one of the best public speakers in the medical profession and holds the commanding position in medical journalism today.

This is an unusual opportunity to see and hear a leading representative of the largest Medical Society in the world.

The Editorial Staff hopes that all who may be able to attend will forward acceptances. Early responses will be appreciated by the committee in charge.

#### THIS WEEK'S ISSUE

CONTAINS articles by the following named authors:

KIRKLIN, B. R. B.S., M.D. Indiana University School of Medicine, 1914, Instructor, Graduate School, University of Minnesota. His subject is: "Efficiency and Limitations of Cholecystography". Page 1487. Address: Mayo Clinic, Rochester, Minn.

WASSON, W. WALTER. A.B., M.D. University of Colorado, 1910, Chancellor American College of Radiology, Director Research The Child Research Council, Radiologist—Children's Hospital and St. Anthony's Hospital, Denver. His subject is: "The Hilus of the Lung". Page 1493. Address: 227 16th Street, Denver, Colorado.

WARD, GRANT E. A.B., M.D. Johns Hopkins 1921, Visiting Surgeon Franklin Square Hospital, Baltimore, Dispensary Surgeon Johns Hopkins Hospital, Interne Johns Hopkins, 1921-22. Associate Howard A. Kelly Hospital 1922-27. His subject is: "Important Considerations of Electro-Surgery". Page 1502. Address: 214-17 Medical Arts Bldg., Baltimore, Md.

BOVIE, W. T. A.B., A.M., Ph.D. Professor of Biophysics Northwestern University Medical School, Chicago, Ill., Formerly Asst. Prof. Biophysics Harvard Univ., Honorary Member of the American Medical Association, Member of the Council on Physical Therapy A. M. A., and Member of the Committee on Standardization, Chairman of the Committee on Education of

the Council on Physical Therapy. His subject is: "The Comparative Efficiency of Sources of Radiation Used in Therapy". Page 1509. Address: Northwestern University Medical School, 303 East Chicago Ave., Chicago, Ill.

DAVIS, DAVID. B.S., M.D. Cornell 1925, Member of Staff of the Boston Dispensary as assistant to Dr. Joseph H. Pratt in charge of the electrocardiograph Dept., Interne 1st Medical Service of the Boston City Hospital (Nov. 1925—July 1927). Address: 485 Commonwealth Ave., Boston, Mass. Associated with him is:

SIDEL, NATHAN. M.D. Harvard Medical School 1923, Assistant in Medicine Boston City Hospital, Teaching Assistant in Medicine, Tufts Medical School. Address: 483 Beacon Street, Boston, Mass. They write on: "The Wassermann Reactions in Jaundice". Page 1516.

BIGELOW, GEORGE H. A.B., M.D. Harvard Medical School 1916, Doctor of Public Health 1921, Commissioner of Public Health of Massachusetts. His subject is: "Present Resources for Handling Tuberculosis in Massachusetts". Page 1517. Address: Department of Health, State House, Boston, Mass.

#### REFERENCES AND COMMENTS REGARDING THE COUNCIL MEETING OF THE MASSACHUSETTS MEDICAL SOCIETY

A LARGE number of the Councilors were present when the meeting was called to order by the President, Dr. Birnie, February 1, 1928.

The Committee of Arrangements reported that the plans for the annual meeting in Worcester next June are well underway and promises very instructive and interesting sessions. The reports of most of the committees were accepted without debate. This means that they were complete and satisfactory. All will repay careful study for they show the important functions of the Society.

Interest was especially centered in the reports of the Committee on the Revision of the By-Laws and the presentation of the recommendation for an assistant to the President by the Vice-President, Dr. T. J. O'Brien, who carried his audience by cogent arguments up to the final culmination of his address when, in using as an illustration of the need of a champion who could meet the enemies of medicine, he referred to the slaying of Goliath by the stone slung by David and announced that *the Stone* had been found which would bring victory to our efforts.

The speech was so well delivered, the climax so well put and the information that Dr. James S. Stone, Ex-President of the Society, would take on this important function so well received that the Council demonstrated its approval most heartily and voted for the necessary appropriation which is to be considered not as a salary but an honorarium.

The President later announced the selection of Dr. Stone to fill this office. In this connection the JOURNAL earnestly hopes that the creation of this new office may prove wise. If the Society is to move forward to meet the constantly increasing demands properly made by its members and by the public some such experiment is necessary. Success or failure depends primarily on the service which the new office renders. It may be of great value to the Society and to the Districts, Sections and Committees as well as to the individual members. But if it is to be of the greatest possible service to all, the demands made upon it must be so great as to be stimulating and so varied as to compel a very liberal and broad policy. The fellows of the Society must do this to make a real success of the experiment.

Another matter of major interest was introduced by Dr. John W. Bartol, the Chairman of the Committee on the Revision of the By-Laws, who carefully explained the proposed changes.

Although the draft proposed by the committee had been mailed to the Councilors the preceding Thursday, some had not received a copy for the delays in the mail had given insufficient time for a careful study. It was evident, however, that the Council is desirous of aiding the Committee so far as possible in making such changes as may add to clarity and efficiency and reduce complexity or contradictions.

The functions of the Committee on Publicity were merged with those of the Committee on Public Health, and those of the Committee on Publications and Scientific Papers and the Committee in Charge of the JOURNAL were combined with the recommendation that a new committee to be known as the "Committee on Publications" consisting of five fellows be created.

The Committee on Malpractice Defence is to be made a Standing Committee according to the proposed draft. This matter was recognized as very important and much interest was shown by the members participating in the debate. It is generally recognized that this Committee will have very important duties to perform which will require courage and the exercise of diplomacy, because conditions with respect to the tendency to institute suits against physicians are disquieting to say the least. The menace is not confined to any one group of practitioners, for suits may be encouraged by ambulance chasers, shyster lawyers, unscrupulous or malingering claimants and, we trust more rarely, by injudicious or unkind remarks by another practitioner.

Every properly minded doctor believes that something effective must be done to prevent unwarranted suits but it is believed that a committee must have zeal tempered with discretion in dealing with all factors involved in efforts to prevent unjust litigation.

All of these matters of detail will undoubtedly be adjusted so that the By-Laws will enable the

Society to secure the best possible results. The Committee has had a difficult task in making this redraft concise, free from contradictions and withal complete and we are sure it expects careful study of its report and constructive suggestions. The perfected draft will be presented to the council meeting in June. The intervening time will give opportunity for members of the Society to give the matter adequate consideration.

It is hoped that the perfect report of the proceedings when prepared by the Secretary and published will be generally read.

Every member should have a feeling of responsibility in all matters of business and functions of the Society.

The Secretary's reports are historical records.

### **The Massachusetts Medical Society**

#### **SECTION OF OBSTETRICS AND GYNECOLOGY**

Foster S. Kellogg, M.D.      Frederick L. Good, M.D.  
Chairman                      Secretary  
Frederick J. Lynch, M.D., Clerk

#### ***The Purpose of a Routine Examination of a Primipara in the Eighth Month.***

THE purpose of a routine examination of a primipara in the eighth month is to obtain information which will be of aid in the conduct of labor and successful termination of pregnancy.

For practical purposes, all patients can be divided into three classes:

- A. The patients who will probably have an uneventful labor and a normal delivery.
- B. The border-line cases, i. e., those in whom some abnormality exists such as a relative pelvic contraction, abnormal presentation, fibroid or other pelvic tumor. The aged primipara should also be in this group. In this class are placed the patients who will probably have a difficult labor with possible Caesarean.
- C. The elective Caesarean class.

The principal factors which determine the course of labor are: (1) The size and contour of the birth canal; (2) The size, position, and presentation of the foetus; (3) The character of the uterine contractions. The last of these obviously can not be predetermined, but an attempt should be made to ascertain the nervous stability of the patient as a whole, and her probable physical reserve, both being important factors during a long hard labor.

No examination is complete without careful pelvimetry, determining thereby the presence of any structural abnormality and its degree. The size, position and presentation of the foetus are equally important in ruling out dystocia. One should observe the condition of the perineum and cervix.

Engagement of the head can best be deter-

mined by bi-manual examination. A primipara with a floating head during the last month of pregnancy bears careful watching, and often needs an examination under an anesthetic to determine the relative size of the presenting part and the pelvic inlet. It is also important to note at the examination the size and shape of the pelvic outlet. Probably as many babies are lost on account of a contracted outlet as by a contracted inlet.

With the event of a low Caesarean, patients in whom disproportion is demonstrable can be given a longer test of labor than formerly when the classical Caesarean was the usual form of operation performed.

Questions of a similar nature to the above will be discussed in the JOURNAL each week. They may be addressed to the Clerk of the Committee, in care of the JOURNAL and will be answered by members of the Committee of the Section of Obstetrics and Gynecology.

### MISCELLANY

#### A HISTORY OF THE RECENT EPIDEMIC OF SMALLPOX IN CONNECTICUT

After being a stranger for 18 months smallpox is present in Connecticut. Only five cases were reported in 1925 and only two in 1926, both of which were reported in June of that year. Thus there have been only seven cases reported in the State during the past three years.

A request reached the office of the State Department of Health for a representative to visit a case of suspected smallpox in Cromwell on Saturday, December 31st, after the office had closed for the day. Examination of this patient showed him to be suffering from smallpox. The source of infection could not be ascertained.

During the following week a case was reported in Chester, eight cases from East Hampton and eleven additional from Cromwell. Among these cases discovered in towns on three sides of Middletown there were a number who had been in Middletown prior to the onset of the disease. Accordingly it was suspected that an unrecognized case or cases had been at large in Middletown. Investigation on Sunday, January 8th, disclosed five cases in one family. The father had been ill for over two weeks, while the mother and three children were in the prodromal stage when discovered. This patient, however, had been under virtual quarantine ever since the onset and had not exposed others to infection.

Investigations during the week of January 9, disclosed the fact that a number of persons had been ill for two or three weeks with smallpox, but that the nature of the disease had not been recognized. This accounts for the exposure of a great many people before anyone was aware that smallpox was present in the community. Persons broken out with smallpox have gone about the streets, visited their neighbors, attended school, Sunday school, church and theatres, and mingled with the crowds in other public places.

For example, smallpox patients were found who had attended Sunday school with the eruption on their faces. One patient is known to have mingled with the crowd around an aeroplane that had landed near Middletown on Sunday, January 8th. One patient had been a waiter in a lunch room or restaurant. Another patient reported that fifty or sixty

people had visited him after he became ill and before the nature of his illness was recognized.

In view of these facts it is no wonder that cases were reported by the dozen. Fortunately, the disease is mild in character. After two or three days of grip symptoms, before the rash comes out, the patients feel well and often do not notice the few pustules that come out on the face and elsewhere on the body.

Owing to the circumstances here recited, it was early recognized that an effective attack upon the outbreak must be made by wholesale vaccination. Accordingly the vaccination of everybody in Middletown was advised. The people promptly responded and swarmed to their physicians to be vaccinated. School authorities ordered the vaccination of school children; employers in stores and factories provided for the vaccination of their employees.

The people of Middletown have sought vaccination so generally that upwards of 19,000 tubes of vaccine have been furnished to the health officer of that city for a population estimated at about 23,000. Some of this vaccine has been used in communities near by, but most of it has gone to immunize the people of Middletown. Free clinics have been held to increase the facilities for vaccination. Continued vaccination of the population will soon cause them to be immune to smallpox so that the disease will quickly disappear.

The experience of Middletown is an experience that may occur in any community where vaccination is neglected. With a population susceptible to smallpox with practically no vaccination, a mild type of smallpox may readily get started in a community and spread extensively before it is recognized as such. "The time to lock the door is before the horse is stolen". The time to prepare for the prevention of smallpox is before an outbreak occurs. Those communities that require vaccination of school children will have enough of their population immune to smallpox to be in a very advantageous position to combat it in case it should make its appearance in their midst.

#### EXCERPTS FROM THE BULLETIN OF THE CONNECTICUT STATE DEPARTMENT OF HEALTH

##### NEW SCORING FOR CLEANLINESS OF MILK

A new method for scoring milk for cleanliness was adopted at the meeting held at the State Capitol on January eight at which representatives from Connecticut approved laboratories were present.

The meeting was called to consider the report of the committee on uniform standards for scoring milk for cleanliness. The report dealt with the adoption of a method for making the test for visible dirt in milk which would be uniform for all Connecticut laboratories.

It was decided that pint samples only shall be regarded as standard and where it is necessary to filter any other size sample, the size of the sample must be stated on the report. One type of tester, the Wisconsin or Lorenz model and the type of disc furnished with that model were adopted and the amount of dirt on any disc, secured from filtering a pint of milk, shall be compared against a standard photograph and scored in terms of clean, fairly clean, slightly dirty, dirty and very dirty and also in terms representing milligrams per pint. Bottled milk shall always be cleaner than fairly clean and shall not show even a score of 1.25 to be classed as satisfactory. The disc containing the dirt actually filtered from the sample of milk shall in all cases be returned to the dairymen, health or dairy official or the milk inspector, together with the report. The former method of reporting samples



in terms of percentage clean is to be completely abandoned on future samples. Such uniformity should result in benefit to the dairy industry and to the individual milk producer.

#### TEN WEEKS DIPHTHERIA CAMPAIGN IN BRISTOL

As a result of an active campaign against diphtheria the people of Bristol should be well pleased with their efforts. Already 50 per cent. of the school children are protected against diphtheria.

This has been brought about through the united efforts of the health department, school department, local physicians and welfare organizations. Accomplishing results in so short a time shows that the campaign was well planned, all organizations were pulling together and the public was well informed on the benefits to be derived from immunization of their children.

#### SURGEON GENERAL CUMMING REAPPOINTED

The appointment of Dr. Hugh S. Cumming for a third term as Surgeon General of the United States Public Health Service was confirmed by the Senate on January 27, 1928. Dr. Cumming, a graduate in medicine of the University of Virginia, entered the Public Health Service as an assistant surgeon in 1894. He was appointed passed assistant surgeon in 1899 and surgeon in 1911. During the war he was detailed for service with the Navy. His first appointment as Surgeon General came in 1920 and he was reappointed in 1924.

Since the definite organization of the United States Public Health Service in 1870, there have been only five surgeons general. Dr. J. M. Woodworth, the first to be appointed, served from 1871 to 1879 and died in office. The second, Dr. J. B. Hamilton, held office from 1879 to 1891, when he resigned. Dr. Walter Wyman, the third surgeon general, also died in office, in 1911, after twenty years in this position. Dr. Wyman's successor was Dr. Rupert Blue, who was not reappointed after the expiration of his second term. Dr. Cumming, who followed Dr. Blue, was serving in Europe at the time of his appointment in 1920. The term of office is for four years, the Surgeon General being nominated by the President and confirmed by the Senate. The same method is used with respect to the Surgeons General of the Army and Navy. Major General M. W. Ireland is now serving his third term at the head of the Medical Department of the Army, while Admiral E. R. Stitt of the Bureau of Medicine and Surgery of the Navy has held his office since 1920.

#### THE SAUNDERS AWARDS

It was decided by Mr. Saunders, who last year offered \$100,000 in prizes for the discovery of effective measures for the prevention and cure of cancer, to close the contest on February 1st. It was to have been open for one year.

During this period, over 2,600 communications have been received by mail from persons, many of whom have had definite suggestions to make for the prize. All applications have been systematically treated. The results have been read and the intention of the writer carefully considered. All proposals have been laid before a board of reference, consisting of students of cancer living in different parts of America, or, to speak more accurately, every proposition received up to February 1st was laid

before that body. Nothing submitted after February 1st was taken into account.

Up to the present time, no proposition has seemed worthy of further investigation.—*Excerpts from The Bulletin of the American Society for the Control of Cancer, Inc.*

#### A DEFINITION

The Specialist: The man who knows more and more about less and less.

### LEGISLATIVE NOTES

#### HOUSE 441

An Act Relative to Sanitary Conditions in Public Eating and Drinking Places.

#### HOUSE 600

Provides that deans or other officers of medical schools upon application may secure cadavers in the custody of state infirmaries or other institutions.

#### HOUSE—No. 601

An Act relative to Contracts for Supplying Hospital Facilities for Persons Suffering from Tuberculosis.

Section seventy-nine of chapter one hundred and eleven of the General Laws as amended by section one of chapter five hundred of the acts of nineteen hundred and twenty-four is hereby further amended by adding at the end of said section the following:—The county commissioners of any county may in like manner and subject to the foregoing provisions relative to renewal contract for suitable hospital accommodations for the treatment and care of tubercular patients of said county elsewhere than in the commonwealth if in their opinion necessary so to do.

#### HOUSE—No. 674

An Act to expedite Hearings under the Provisions of the Workmen's Compensation Act.

#### HOUSE 748

An Act relative to the Limitation of Actions against Physicians and Others for Malpractice, Error or Mistake.

Section 1. Section four of chapter two hundred and sixty of the General Laws, as amended by section one of chapter three hundred and nineteen of the acts of nineteen hundred and twenty-one, is hereby further amended by inserting after the word "accrues" in the ninth line, the words:—or becomes known—so as to read as follows:—Section 4. Actions for assault and battery, false imprisonment, slander, actions against sheriffs, deputy sheriffs, constables or assignees in insolvency, for the taking or conversion of personal property, actions of tort for injuries to the person against counties, cities and towns and actions of contract or tort for malpractice, error or mistake against physicians, surgeons, dentists, hospitals and sanitariums, shall be commenced only within two years next after the cause of action accrues or becomes known; and actions for libel shall be commenced only within one year next after the cause of action accrues.

Section 2. This act shall take effect upon its passage.

#### HOUSE BILL 791

An Act Relative to the Qualifications of Applicants for Registration as Nurses.

This bill materially modifies the powers and duties of registrations of nurses.



SENATE—No. 176

An Act relative to the Heating of Milk Intended for Sale.

Chapter ninety-four of the General Laws is hereby amended by adding after section forty-eight A the following new section:—

Section 48B. Whoever applies artificial heat exceeding one hundred degrees Fahrenheit to milk intended for sale, shall heat such milk to a temperature of not less than one hundred and forty degrees Fahrenheit for a period of not less than thirty minutes and if such temperature exceeds one hundred and forty-five degrees Fahrenheit, to a temperature greater than one hundred and sixty-seven degrees Fahrenheit. Whoever violates the provision of this section shall be punished by a fine of not more than one hundred dollars for each offence.

SENATE—No. 197

An Act relative to the Treatment of Persons suffering from Tuberculosis in State Sanatoria.

Chapter one hundred and eleven of the General Laws is hereby amended by inserting after section sixty-five A, inserted by section one, chapter five hundred and eight of the acts of nineteen hundred and twenty-four, the following new section:—

Section 65B. Any person who has been a resident of the commonwealth for six months or more, found to be suffering from tuberculosis and in need of hospitalization, shall be entitled to treatment as a patient in any state sanatorium.

RECENT DEATHS

**HEWINS**—DR. PARKE WOODBURY HEWINS, a Fellow of the Massachusetts Medical Society since 1882, died at his home in Wellesley Hills, February 4, 1928, at the age of 72.

He was born in Lawrence, May 19, 1855, and much of his early life was spent in Taunton, where he prepared for college. From Harvard he received his degree of A.B. in 1878 and his M.D. in 1883. He practiced medicine for several years before joining his brother in the real estate business. For the past twenty-five years his home had been in Wellesley Hills. He had been an invalid since 1889 and was unable to practice.

He is survived by his wife, who was Jessie Warner of Lockport, N. Y., and a daughter, Miss Elizabeth Hewins, who lives at home.

Dr. Hewins was identified with the Masonic fraternity and was a member of the Harvard Club, Boston Chamber of Commerce, Massachusetts Republican Club, Home Market Club and the Wellesley Hills Country Club.

**STAFFORD**—DR. FRANK DALMON STAFFORD, of North Adams, died in that city, January 21, 1928, aged 71. He was a graduate of the University of Vermont, College of Medicine, in 1878, and had practised medicine in North Adams since after a short time in Whittingham, Vt. He had been four times Mayor of North Adams.

**SHELDON**—DR. CHAUNCEY COOLIDGE SHELDON, a Fellow of the Massachusetts Medical Society since 1876, died at his home in Lynn, January 31, 1928. He was born in Waterville, Me., Dec. 11, 1848, was a graduate of Harvard Medical School in 1877, was a house officer at Boston City Hospital, and settled in Lynn, where he was superintendent of the Lynn Hospital for thirty years. He was a member of the Harvard Club of Boston and of the Oxford Club of Lynn. His wife, who died in 1918, was Mary Louise Firth. A son, Russell Firth Sheldon, M. D., is a practitioner of Boston, specializing in anaesthesia. He is a Fellow of the Massachusetts Medical Society.

**JAMES**—DR. FRANCES CECILIA JAMES, a graduate of the Woman's Medical College of Pennsylvania in 1886, a former practitioner in Melrose, died in Boston, January 30, 1928, at the age of 72.

OBITUARIES

RESOLUTIONS ON THE DEATH OF  
ROBERT E. HARNEY, M.D.

On October 3, 1927, the Carney Hospital Staff lost by death one of its members, Dr. Robert E. Harney, who was connected with the Pediatric Division of the Medical Out-Patient Department.

Dr. Harney typified kindness, honesty and modesty. He was conscientious and painstaking in regard to his duties. After ill health had placed its impression upon him, he exerted himself perhaps more than was wise in carrying out his assumed obligations.

As a father and husband, Dr. Harney was devoted, loving and thoughtful. To his patients, he gave the best that was in him so far as he was permitted.

*Resolved*, That a letter be sent to the family of Dr. Harney, expressing the profound sympathy of the Governing Board of the Carney Hospital.

*Resolved*, That a copy be sent to the BOSTON MEDICAL AND SURGICAL JOURNAL for publication, and a similar copy be entered upon the official records of the board.

PAUL J. JAKMAUH, M.D.,  
DANIEL F. MAHONEY, M.D.,  
*Committee.*

RESOLUTIONS ON THE DEATH OF RALPH  
WENTWORTH JACKSON, M.D.

*Whereas*, The Carney Hospital has suffered the loss of a faithful and able servant in the recent death of Ralph Wentworth Jackson:

*Whereas*, Each and every member of the Staff feels in his death a great and personal loss:

*We*, the members of the Governing Board, do hereby *Resolve*:

To express the great loss which the Board feels that the hospital has suffered in a department which he had developed and which was beginning to rank as one of the finest special clinics of this city.

To place this expression of loss upon the records of the Governing Board of the Carney Hospital and that a copy of this record be sent to Mrs. Gertrude Jackson.

F. B. LUND, M.D.,  
W. R. MACAULAND, M.D.,  
*Committee.*

CORRESPONDENCE

ARTICLES ACCEPTED BY THE A. M. A. COUNCIL  
ON PHARMACY AND CHEMISTRY

*Dear Doctor:*

In addition to the articles enumerated in our letter of December 30th, the following have been accepted:

Hermes-Groves Dairy Co.—*Bacillus Acidophilus* Milk-Hermes.

Lederle Antitoxin Laboratories—Anterior Pituitary Desiccated-Lederle, Posterior Pituitary Desiccated-Lederle, Whole Pituitary Desiccated-Lederle.

Eli Lilly & Co.—*Iletin* (Insulin-Lilly) U-100, 10 cc., Liver Extract No. 343.

H. K. Mulford Co.—Sterile Solution of Dextrose (d-Glucose) 50 cc., Double End Vial.

Sharp & Dohme—Hexylresorcinol Solution S. T. 37.

Yours truly,  
W. A. PUCKNER, *Secretary.*

CONTRIBUTIONS OF MEDICAL MEN  
TO MEDICAL CHARITY

Boston, January 30, 1928.

*Editor, Boston Medical and Surgical Journal:*

In your issue of January 26th, I note an extract from the *Indiana Medical Journal* calling attention to the self-contribution of medical men to medical charity.

We are constantly solicited to give money for the care of the sick poor. This does not seem to me just. In and out of hospitals we give our time, brains, and often money also to the sick who come under our care. No calling gives as much to the sick poor.

I have long made it a rule (occasionally broken) not to give money for the hospital care of the sick poor. Of course I do not mean we should not give if we choose so to do. I mean that we should not be expected to give money for that purpose or criticized if we do not give it.

The heart melts more easily over the sight or story of the sick poor at our gate than over the thought of preventive world suffering. We are always ready to give ourselves. Lay folk should provide money for the cause.

If medical men want to give money, why not give it to the fundamentals of medicine which have comparatively few friends and which can and do have far reaching effects.

Incidentally, the *Indiana* article throws light on the community chest which is really extortion when applied to physicians for medical charities, and may be a hold-up for many people. The community chest has its conveniences; but these, I am inclined to believe, are outweighed by disadvantages. I hope that Boston may long go on in the good old way which has given good results so far. Perhaps this view indicates senescence, possibly senility, on the part of

Yours sincerely,

F. C. SHATTUCK.

## DR. HOLMES' DIPLOMACY

*Mr. Editor:*

As I read with intense pleasure Dr. Monks' recent article on Dr. O. W. Holmes there came back to me (one of those who at one o'clock stormed those ladder-like stairs, fought for positions in the front lines and when the door was suddenly opened, fell down the equally ladder-like aisle to the much sought after front seats) a Holmes incident which is possibly worthy of record.

It was the custom for one of the professors to proffer a breakfast to the graduating class and the year of my own graduation that duty devolved on Dr. Holmes.

We breakfasted at his Beacon Street house, were taken up to the library, shown the famous anatomical plates, talked to in turn and being without an official head perhaps overstayed our welcome.

At any rate Dr. Holmes walked over to me and asked if I had noticed the portrait of Dorothy Q. and on my response in the negative piloted me to it.

It hung in the hall exactly opposite the head of the stairs leading to the lower hall and the street.

After telling me its history he, with a smile said, "This is a most useful picture to me. All sorts of people come in to see me and some of them do not know when to leave. I ask them if they would not like to see the picture of Dorothy Q. and as it hangs where it does they see an avenue of escape and usually avail themselves of it."

I found myself almost without volition on the way out but in such a kindly and unconscious manner was the hint conveyed that I felt no particle of resentment.

When, however, I reached the street followed like a herd of sheep by my classmates I was overcome with laughter at the neat way in which our call was terminated.

SAMUEL B. WOODWARD.

## NEWS ITEMS

**HARVARD MEDICAL SCHOOL NEWS**—The following appointments and scholarship awards were made public at the Harvard Medical School on February 1, 1928:

From February 1, 1928—Frank Burr Mallory, M.D., Professor of Pathology.

From February 1, 1928, to September 1, 1928—Cornelius Packard Rhoads, M.D., Instructor in Pathology.

Scholarship Awards, Upper Classmen, 1927-1928, with name of scholarship, to whom awarded and class:

Edward M. Barringer, No. 1—Vernon Phillips Williams, 4M.

Edward M. Barringer, No. 2—Gustaf Elmer Lindskog, 4M.

Gordon Bartlett—Ira Milburn Dixon, 4M.

Matthew and Mary E. Bartlett—Paul Willard Hugenberger, 2M.

Lucius F. Billings, Nicholas Sarro, 2M.

Orlando W. Doe—Lewis Sears, 3M.

Joseph Eveleth, No. 1—Harry Metcalfe Spence, 2M.

Joseph Eveleth, No. 2—Horace Chilton Sweet, 2M.

Joseph Eveleth, No. 3—Robert Jefferson Joplin, 4M.

Horace Putnam Farnham, No. 1—Elwood Reid Rafuse, 2M.

Horace Putnam Farnham, No. 2—Charles Philip Sheldon, 3M.

Lewis and Harriet Hayden—Hildrus Augustus Poindexter, 3M.

Hilton, No. 1—John Hundale Lawrence, 2M.

Hilton, No. 2—Jibril Yusuf Skeirik, 3M.

William Otis Johnson—David William Wallwork, 2M.

Claudius M. Jones—Henry Joseph Stanford, 2M.

Alfred Hosmer Linder—Lloyd I. Ross, 3M.

Joseph Pearson Oliver—Luther Milton Straver, Jr., 2M.

Charles B. Porter—Henry Gisler Clarke, 2M.

Flavius Searle—James Martin Woodall, 2M.

Charles Pratt Strong—Herbert Dan Adams, 3M.

Isaac Sweetser—David Hurwitz, 3M.

John Thomson Taylor—Harold Henry Hamilton, 2M.

Dr. Charles Walker, No. 1—Alfred Kranes, 2M.

Helen L. Walker, No. 2—Chauncey Valentine Perry, 4M.

Anna G. Walker, No. 3—John Dunham Stewart, 4M.

Leslie W. Walker, No. 4—Weston Turner Buddington, 3M.

Abraham A. Watson—Albert Bradley Hodgman, 2M.

Edward Wigglesworth—Milton Leonard Miller, 3M.

Cotting Gift—Roy Elbridge Mabrey, 3M.

James Ewing Mears—William Edwin Davis, 4M.

**STATE HAS LOWEST TYPHOID DEATH RATE IN HISTORY**—Notwithstanding that there were three outbreaks of typhoid fever in Massachusetts during the year 1927, the death rate from this disease was the lowest ever reported by any State. Dr. George H. Bigelow, State Commissioner of Public Health, announced that the death rate from typhoid was 1.1 per 100,000 of population, and that while this figure has been surpassed by a few cities, it has never been equalled by any State.

"This, however, should not give cause for undue optimism," he continued, "since, as has been tragically demonstrated, the typhoid carrier is still with

us. The department's records show the whereabouts of sixty carriers, whereas there are presumably about 2000 in the State. Of the three outbreaks last year, one was traced to a carrier on a milk farm, another to a carrier in a private school and the third to a carrier handling food at a church supper.

"At present health officers have inadequate authority not only to control typhoid carriers, but to obtain information on which the basis of recognition rests. Unless the typhoid carrier is controlled our enviable record may very well be a thing of the past."—*Boston Transcript*.

**THE COMFORT ZONE**—It was recently stated at one office that the "subtropical" conditions that prevailed there probably reduced the efficiency of the staff by ten to twenty per cent. It was observed that in the late morning and afternoon hours the staff "drooped" at their work, office speed slackened and a spirit of drowsiness prevailed.

It was suggested that a complete change of air at frequent intervals might be effective, as a check up of the temperatures in the different rooms showed a variation of from five to ten degrees. Apparently "some liked it hot and some liked it cold". It was the former portion of the staff that succumbed more quickly than the latter.

Now it is known through the exhaustive studies made by the New York Ventilating Committee that a thermometer reading of slightly below 70° F. gives ideal working conditions and that efficiency lessens with each degree of temperature above that point. A loss of fifteen or more per cent. may result from higher temperatures.

## NOTICES

### CONFERENCE ON RHEUMATIC DISEASES

A Conference on Rheumatic Diseases is to be held at Bath, England, on Thursday and Friday, May 10th and 11th, 1928. Sir George Newman, Chief Medical Officer of the British Ministry of Health, has kindly consented to act as President of the Conference. There will be three Sessions: (1) Social Aspects, presided over by Lord Dawson of Penn, Physician to H. M. King George, (2) Causation, presided over by Sir Humphry Rolleston, (Regius Professor of Physic, University of Cambridge), and (3) Treatment, presided over by Sir E. Farquhar Buzzard, (Regius Professor of Medicine, University of Oxford). The local Hon. Medical Secretary is Dr. Vincent Coates, 10, Circus, Bath, England.

### CORRECTION

In the review "Max von Pettenkofer, His Theory of the Etiology of Cholera, Typhoid Fever and Other Intestinal Diseases, a Review of His Arguments and Evidence", by Edgar Erskine Hume, which appeared in our issue of February 2, page 1486, the name of the book was incorrectly printed. It is correct as it appears here.

### UNITED STATES CIVIL SERVICE EXAMINATIONS

The United States Civil Service Commission announces the following open competitive examinations:

Social Worker (Psychiatric), \$1,860.

Junior Social Worker, \$1,680.

Applications for social worker (psychiatric) and junior social worker will be rated as received by

the Civil Service Commission at Washington, D. C., until June 30.

The examinations are to fill vacancies in the Veterans' Bureau, and in positions requiring similar qualifications throughout the United States.

Full information may be obtained from the United States Civil Service Commission at Washington, D. C., or the secretary of the United States civil service board of examiners at the post office or custom-house in any city.

### ASSISTANT MEDICAL OFFICER, ASSOCIATE MEDICAL OFFICER, SENIOR MEDICAL OFFICER

Applications will be rated as received by the Civil Service Commission at Washington, D. C., until June 29, 1928.

The United States Civil Service Commission announces open competitive examinations under the above titles for filling vacancies occurring in the Federal classified civil service throughout the United States, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

There is especial need for medical officers qualified in tuberculosis or neuro-psychiatry.

Salary and Promotion, Departmental Service—The entrance salaries for these positions in the Departmental Service, Washington, D. C., are: Assistant Medical Officer, \$2,400 a year; Associate Medical Officer, \$3,000 a year; Medical Officer, \$3,800 a year; Senior Medical Officer, \$5,200 a year.

### JUNIOR MEDICAL OFFICER (INTERNE), \$1,860-\$2,400

Applications will be rated as received by the Civil Service Commission at Washington, D. C., until June 30, 1928.

The United States Civil Service Commission announces an open competitive examination for Junior Medical Officer (Interne). Vacancies in U. S. Veterans' Bureau Hospitals throughout the United States, and vacancies in positions requiring similar qualifications, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

Salary and Promotion—The entrance salary for this position in the field service of the Veterans' Bureau is \$1,860 to \$2,400 a year without allowances, or \$1,260 to \$1,860 a year with quarters, subsistence, and laundry.

Applications—Forms 2600 and 2398, which are required, may be secured from the following (the title of the examination desired should be stated): The U. S. Civil Service Commission, Washington, D. C.; the Secretary of the U. S. Civil Service Board, Customhouse, Boston, Mass., New York, N. Y., New Orleans, La., Honolulu, Hawaii; Post Office, Philadelphia, Pa., Atlanta, Ga., Cincinnati, Ohio, Chicago, Ill., St. Paul, Minn., Seattle, Wash., San Francisco, Calif., Denver, Colo.; Old Customhouse, St. Louis, Mo.; Administration Building, Balboa Heights, Canal Zone; or the Chairman of the Porto Rican Civil Service Commission, San Juan, P. R.

The United States Civil Service Commission announces the following open competitive examination:

### Junior Medical Officer (Interne)

Applications for junior medical officer (Interne) will be rated as received by the Civil Service Commission at Washington, D. C., until June 30, 1928.

The examination is to fill vacancies in Veterans' Bureau hospitals throughout the United States, and in positions requiring similar qualifications.

The salary ranges from \$1,860 to \$2,400 a year without allowances, or from \$1,260 to \$1,860 a year with quarters, subsistence, and laundry, the entrance salary within the range stated depending upon the qualifications of the appointee and the duty to which assigned.

The duties, under immediate supervision, are to admit patients, take histories, make physical and mental examinations and record findings; to make ward rounds of inspection, note charts, record observations; to prescribe for minor ailments or for acute or emergency cases and to dispense medicine in emergency; to perform minor surgical operations and to assist at major operations and in redressing; to administer anaesthetics; to make routine laboratory tests and analyses; to assist at out-patient clinics in dressing and in administering vaccines; to keep records, make up case histories, answer correspondence relating to patients, and compile statistics requiring medical training.

Competitors will not be required to report for examination at any place, but will be rated on their education, training, and experience.

Full information may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the United States civil service board of examiners at the post office or customhouse in any city.

## REPORTS AND NOTICES OF MEETINGS

### BOSTON ORTHOPEDIC CLUB

A meeting of the Boston Orthopedic Club was held on Monday, January 23, 1928, in the Boston Medical Library.

The report of the committee appointed to effect a reorganization of the Club was heard, this reorganization consisting in a new set of by-laws and constitution, the name to remain the same.

The nominating committee reported for President, Dr. James W. Sever; for Secretary, Dr. R. K. Ghormley; for member of the Executive Committee for three years, Dr. A. L. Brett; for two years, Dr. Murray Danforth; for one year, Dr. John W. O'Meara. The nominations were closed and the secretary was instructed to cast a unanimous ballot.

The papers of the evening were then read. The first was by Dr. Scudder, who reported on Delbet's treatment of fifteen cases of fractured neck of the femur treated by fibula graft, with good results in thirteen of the cases. Dr. Scudder's point was to bring out this type of treatment, and the discussion which followed favored the bony operations rather than fixation by foreign material.

Dr. Jepson's paper was then read, in which he treated the question of non-union, and discussed the causes and the various types of treatment. He favored the inlay graft in the tibia, and elsewhere, the massive graft. He favored the use of beef bone screws. The paper was discussed by Dr. Cotton, Dr. Scudder, Dr. Wilson, Dr. Betts, a visiting surgeon from Australia, and Dr. Sever.

### MEETING OF THE HAMPDEN COUNTY MEDICAL SOCIETY

The Hampden County Medical Society held a meeting January 24th at 4:15 P. M. Doctors P. E. Gear and S. A. Mahoney, Jr., presented some unusual urological cases. Dr. Gear presented his cases from the clinical viewpoint, while Dr. Mahoney discussed the X-ray aspect.

Dr. Dudley Carleton read a paper on a series of spondylitis cases and emphasized the frequency of the pneumococcus as the causative organism. He discussed its favorable response to treatment.

Dr. F. B. Sweet discussed a series of cases of carcinoma of the large intestine.

The two latter speakers illustrated their talks with lantern slides.

A questionnaire was issued concerning the opposition, if any, to the insurance company approved by the Massachusetts Medical Society.

The meeting was adjourned at 6:20 P. M., after which luncheon was served.

JEROME A. WHITNEY, M.D.

### PHYSIOLOGICAL CONFERENCE

A meeting of the Physiological Conference was held in the Bowditch Library at the Harvard Medical School at 4 o'clock on the afternoon of January 18, 1928. Dr. Hallowell Davis of the faculty, assisted by Miss Rice, presented a paper entitled, "The Penetration of Narcotics into Nerve Trunks, with reference to Decremental Conduction."

Dr. Davis pointed out that the idea of conduction with a decrement is now a firmly established idea. The experiences of Lucas and the more recent experiences of Miss Cooper with narcotized nerve trunks seem to present evidence in favor of this statement of Dr. Davis. Narcotics applied to a nerve cause an increase in the "least interval." This is because either recovery is slower or impulses conducted with a decrement are lost. Lucas found that the farther away from the muscle the nerve was stimulated in a series of narcotizing chambers the less the "least interval" was affected and the sooner the conduction potentiality was extinguished. Two causes can be assigned to this: first, it may be due to an anatomical difference in the nerve, the sheath being more permeable the farther away from the muscle it is tested, and second, the relative diameter of the nerve varies enough in different places to change the conduction time compared in those parts. Experiments were undertaken to prove or disprove these points.

Nerve-muscle preparations of frogs were used. The nerve was divided into its distinct anatomical parts and mounted crosswise in 8 mm. chambers. Three per cent. chloral hydrate was used as the narcotic. The results were expressed as the difference in time of action divided by one hundred times the time since the last failure of the preparation to react to stimuli. The time was taken with a stop watch. The results of these experiments showed no clear correlation of the varying diameters of the nerve fibers to the variations in conduction time. There was no relation of temperatures, except that it took a longer time at low temperatures for the narcotic to act. No clear results were obtained to account for the failure of conduction at the central end of the nerve before peripheral failure. Controls were done on the differential cleaning of the nerve fibers in the preparation of the experiments.

Kato, the Japanese physiologist, contends that the failure of the nerve to conduct, which occurs first at the places where branching of the nerve trunk occurs, is due probably to unconscious trauma inflicted at operation. This makes the nerve more susceptible to narcosis at that point. Dr. Cannon pointed out that this effect might be due to diffusion of the narcotizing vapor into the cut ends of the branching nerves.

The conclusions which Dr. Davis and Miss Rice deduced from these experiments are: first, a small nerve fails to conduct earlier than a large nerve; second, there is no clear correlation between time of conduction and the size of the nerve; third, within experimental error there is no difference in conduction between nerves or parts of nerves of different diameters; fourth, complete cleaning of a nerve leads to earlier failure in conduction potentiality.



#### NEW ENGLAND PEDIATRIC SOCIETY

The one hundred and fourth meeting of the New England Pediatric Society will be held at the Boston Medical Library on Friday, February 10, 1928, at 8:15 P. M.

The following paper will be presented:

The Thymus Obsession, John Lovett Morse, M.D., Boston.

To be discussed by: P. F. Butler, M.D., Boston; L. B. Morrison, M.D., Boston; C. T. Porter, M.D., Boston.

Light refreshments will be served after the meeting.

WILLIAM W. HOWELL, M.D., *President*.  
RANDOLPH K. BYERS, M.D., *Secretary*.

#### BOSTON ORTHOPEDIC CLUB

A meeting of the Boston Orthopedic Club will be held in the Sprague Hall of the Boston Medical Library on Monday evening, February 13, at 8:15 p. m.

##### PROGRAM

1. "Fractures of the Pelvis," by Dr. J. W. Sever.
2. "The Adaptive Changes in the Hip in Congenital Dislocation," by Dr. Nathaniel Allison.
3. "Ruptured Biceps, a New and Simple Operation," by Dr. F. J. Cotton.

R. K. GHORMLEY, *Secretary*.

#### HARVARD MEDICAL SOCIETY

The next regular meeting of the Harvard Medical Society will be held as usual in the amphitheatre of the Peter Bent Brigham Hospital, Tuesday evening, February 14, at 8:15 p. m. The program follows:

Presentation of cases.

Some observations on 556 cases of peptic ulcer.

Dr. Edward S. Emery, Jr., Dr. Robert T. Monroe.  
PERCIVAL BAILEY, *Secretary*.

THE MASSACHUSETTS DIETETIC ASSOCIATION has scheduled the following lectures:

Tuesday, February 14, at 8 p. m., S. Etta Sadow, Director of Home Economics Bureau District Service of the Federated Jewish Charities, Boston, will speak on "Jewish Ceremonials and Food Customs."

Tuesday, March 13, at 8 p. m., Joseph C. Aub, M.D., Associate in Medicine of the Massachusetts General Hospital, Boston, will speak on "Mineral Metabolism."

Tuesday, April 10, at 8 p. m., Ruth Wheeler, Ph.D., Professor of Nutrition and Physiology, Vassar College, Poughkeepsie, N. Y., will speak on "Teaching Nurses Dietetics and Dietotherapy."

#### THE BOSTON HEALTH LEAGUE

will hold its annual dinner meeting on Wednesday, February 15, at 7 p. m., at Hotel Kenmore, 496 Commonwealth Avenue.

Dr. George C. Shattuck, Assistant Professor of Tropical Medicine, Harvard School of Public Health, will speak on "Scenes in Tropical Africa" (illustrated).

Members are cordially invited to bring guests.

#### MEETING OF THE MASSACHUSETTS PSYCHIATRIC SOCIETY

A meeting of the Massachusetts Psychiatric Society will be held at the Boston Psychopathic Hospital, 74 Fenwood Road, Boston, Mass., Friday, February 17th, at 8 P. M.

The address of the evening will be delivered by Dr. Frankwood E. Williams, Medical Director of the National Committee for Mental Hygiene, New York City. His subject will be "The Future Equipment of Personnel in the Field of Mental Hygiene".

WINFRED OVERHOLSER, *Secretary*.

#### MIDWINTER MEETING AND DINNER, MASSACHUSETTS SOCIETY OF EXAMINING PHYSICIANS

The Copley Plaza, Wednesday, February 15, 1928, 6:30 P. M. \$2.50 a plate.

Speakers: 1. John H. Cunningham, M.D.: "The Enlarged Prostate and Its Relation to Hernia and Backache."

2. Robert Homans, Esq.: "The Increasing Incidence of Malpractice Suits."

Discussion opened by Henry V. Cunningham, Esq., and Thomas J. O'Brien, M.D.

CHAS. P. SYLVESTER, M.D., *President*.  
WM. PEARCE COUES, M.D., *Secretary*.

#### THE ANNUAL MEETING OF THE AMERICAN SOCIETY FOR THE CONTROL OF CANCER

This year an unusual effort is to be made to bring about a large and interesting meeting of this Society at which members and friends of the Society will gather to discuss the question of cancer control. The meeting will take place on Saturday, March 3rd. In the morning there will be meetings of the Executive Committee and Board of Directors. The rest of the day will be given up to a luncheon at one of the large hotels in the central part of the city and to discussions and the exchange of facts and opinions relating to the practical work in the many states where the Society is carrying on its work. There will be addresses by persons of authority on the parts which health departments and the medical profession can and should take in the control of the cancer scourge.

In the morning while the business meetings are taking place, there will be an interesting exhibit offered for visitors to attend, a demonstration of modern cancer research. This demonstration will be made at the Crocker Institute of Cancer Research of Columbia University by the director, Dr. Francis Carter Wood. All who attend the meeting of the Society will be welcome to witness this demonstration.

The luncheon will take place at the Biltmore Hotel, Madison Avenue and Forty-third Street, at 1 o'clock. The demonstration will be at the Crocker Laboratory, Amsterdam Avenue and 116th Street, at 10:30 o'clock. The next issue of *Campaign Notes* will give further details of the meeting.

#### SOCIETY MEETINGS

February 9—Massachusetts General Hospital Staff Meeting. Detailed notice page 1488, issue of February 2.

Detailed notices of the following meetings appear elsewhere on this page:

February 10—New England Pediatric Society meeting.

February 13—Boston Orthopedic Club meeting.

February 14—Harvard Medical Society.

February 14, March 13, April 10—Massachusetts Dietetic Association.

February 15—Boston Health League.

February 15—Midwinter meeting and dinner, Massachusetts Society of Examining Physicians.

February 17—Massachusetts Psychiatric Society.

March 3—Annual meeting of the American Society for the Control of Cancer.



## DISTRICT MEDICAL SOCIETIES

## Essex North District Medical Society

May 2, 1928 (Wednesday)—Annual meeting at Haverhill, 12:30 P. M., at the Haverhill Country Club, Brickett Hill, Gile Street, Haverhill.

May 3, 1928 (Thursday)—Censors meet for examination of candidates at Hotel Bartlett, 95 Main Street, Haverhill, at 2 P. M. Candidates should apply to the Secretary, J. Forrest Burnham, M.D., 567 Haverhill Street, Lawrence, at least one week prior.

## Essex South District Medical Society

March 7 (Wednesday)—Lynn Hospital. Clinic at 5 P. M. Dinner at 7 P. M.

Dr. Henry R. Viets, "The Acute Infections of the Nervous System," with lantern slides and moving pictures.

Discussion by Dr. W. V. McDermott of Salem and J. W. Trask of Lynn, 10 minutes each, and from the floor.

April 11 (Wednesday)—Essex Sanatorium, Middleton. Clinic at 5 P. M. Dinner at 7 P. M.

Dr. Raymond S. Titus, "Obstetrical Emergencies."

Discussion by Drs. J. J. Egan of Gloucester and A. T. Hawes of Lynn, 10 minutes each, and from the floor.

May 3 (Thursday)—Censors meet at Salem Hospital for the examination of candidates at 3:30 P. M. Candidates should apply to the Secretary, Dr. R. E. Stone, Beverly, at least one week prior.

May 8 (Tuesday)—Annual meeting. Detailed notice appears on page 1437, this issue.

## Norfolk District Medical Society

February 29—Roxbury Masonic Temple. Orthopedics in General Practice. Dr. Paul N. Jepson.

March 27—Meeting at the Norwood Hospital. Presentation of paper or cases from members of the District.

May 3—Censors' meeting. Roxbury Masonic Temple, 4 P. M. Applications will be mailed by the Secretary upon request.

May 8—Annual meeting. Details to be announced.

## Suffolk District Medical Society

Combined meetings of the Suffolk District Medical Society and the Boston Medical Library will be held at the Boston Medical Library, 8 The Fenway, at 8:15 P. M., as follows:

February 29—Surgical Section. Subject to be announced later.

March 28—Medical Section. "The Use and Misuse of Vaccines." Dr. Hans Zinsser. Dr. Francis M. Rackemann, Dr. Charles H. Lawrence.

April 25—Annual meeting. Election of officers. Paper of the evening to be announced later.

The medical profession is cordially invited to attend these meetings.

Notices of meetings must reach the JOURNAL office on the Friday preceding the date of issue in which they are to appear.

## BOOK REVIEWS

*Modern Medicine, Its Theory and Practice.* Edited by SIR WILLIAM OSLER, BART, M. D., F. R. S. Third Edition. Thoroughly Revised. Re-edited by THOMAS McCRAE, M. D., Assisted by ELMER H. FUNK, M. D. Vol. V. Lea and Febiger, Philadelphia, 1927.

This fifth volume of the third edition of Osler's System is divided into six parts. Part I treats of diseases of the blood and opens, as in the earlier editions, with Dr. Richard Cabot's two chapters on (1) the general pathology of the blood forming organs and (2) anaemia and leukaemia. Dr. Joseph H. Pratt's chapter on purpura and haemophilia has been considerably condensed. The chapter on diseases of the spleen is written by Dr. E. B. Krumbhaar, replacing the one written by Dr. Lyon. A chapter on blood transfusion by Dr. Harold W. Jones concludes Part I.

Part II, entitled "Diseases of the Lymphatic System," contains Dr. Warthin's chapter on diseases of the lymphatic glands and a new chapter on Hodgkins' Disease by Dr. W. T. Longcope. Part III diseases of the ductless glands. Dr. Dock has revised, with the assistance of Dr. H. Lissner, his chapters on the adrenals, the thyroid and the pituitary, and has

written new chapters on the parathyroids and the pineal. A chapter on the thymus by Dr. Warthin concludes this section.

Part IV is the section on diseases of the urinary system. It opens with the late Dr. John McCrae's introductory chapter, revised by Dr. L. G. Rowntree. Dr. John McCrae's chapter on malformations and circulatory disturbances of the kidney is revised by Dr. Thomas McCrae, as is also Sir A. E. Garrod's chapter on "Anomalies of the Urinary Secretion." Dr. J. B. Herrick's five chapters on nephritis are replaced by two chapters by Dr. J. P. O'Hare. Dr. Thomas Brown's chapters on tuberculosis and pyogenic infections and Dr. Hugh Young's chapters on tumors, lithiasis and the prostate conclude this section.

Part V treats of vasomotor and tropic disorders—Raynauds Disease, angio-neurotic oedema and erythromelalgia. All three chapters, written by the late Sir William Osler, have been revised by Dr. Archibald Malloch, M. R. C. P. Part VI is entitled in this edition "Diseases of the Locomotor System." Dr. Steiner's monographs on myositis and myotonia are grouped in one chapter. Dr. Thomas McCrae contributes a chapter on arthritis deformans, and Dr. George Dock an article on osteomalacia. The concluding chapter, by Dr. Charles P. Emerson, discusses achondroplasia, the osteoarthropathies and a few other allied conditions.

## RICHARDSON'S "Infectious Diseases and Aseptic Nursing Technic."

A valuable contribution to nursing texts has been made in Doctor Richardson's "Infectious Diseases and Aseptic Nursing Technic." Such a book is doubly welcome coming from a doctor with the clinical and teaching experience of Doctor Richardson.

It meets the aim of the book exactly, i. e., "to present the salient facts about infectious diseases which a nurse needs to know," and it does so with a style that is clear, concise and definite.

The subject matter is presented in excellent form for study and for reference. Paragraph headings clearly outline for each subject, etiology and epidemiology, mortality, incubation period, symptoms and signs, complications and treatment. Emphasis is placed on the aspects which are most important for the nurse to be familiar with, especially the transmissibility of each disease.

The material on serum treatments is up to date. Infection and immunity are discussed in the opening chapter.

The last part of the book deals with aseptic nursing technic. It is the best hand-book extant on this subject, and it is altogether too meagre!

The chapter on Care of Infectious Diseases at Home offers a source of information that will be eagerly sought by nurses who have not had the advantage of communicable disease training.

## BOOKS RECEIVED FOR REVIEW

*Handbook for the Medical Soldier.* By Arnold Dwight Tuttle. New York. Wm. Wood & Co. 691 pages. Price, \$5.00.

*Glasgow Royal Maternity and Women's Hospital. Medical Report for the Year 1926.* Glasgow. Wm. Hodge & Co. 74 pages.

*Verlagskatalog.* J. F. Bergmann in Munchen 1878-1928. 166 pages.

*A Textbook of Bacteriology and Its Applications.* By Curtis M. Hilliard. Boston. Ginn & Co. 329 pages. Price, \$2.80.

*Neoplastic Diseases.* By James Ewing. New York. W. B. Saunders Company. 1127 pages. Price, \$14.00.

*Bedside Diagnosis.* By American Authors. W. B. Saunders Company. 2820 pages. Price, \$30.00 a set.